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SECTION OF THE HISTORY OF MEDICINE.

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Section of the History of Medicine.

November 19, 1913.

Sir HENRY MORRIS, Bt., Vice-President of the Section, in the Chair.

St. Hildegard.

By CHARLES SINGER, M.D.

HILDEGARD, of Bingen, was born at Böckelheim in 1099, and died at Rupertsberg, opposite Bingen, in 1179. At the age of 8 she was placed in the hands of Jutta, a female recluse who had taken up her dwelling on the Mount of St. Disibode, a few miles from Bingen and on the banks of the Nahe. Jutta gradually collected around her a number of other pious women and thus formed a nunnery. On the death of Jutta in 1136, Hildegard took the office of prioress, but in 1147 she and some of her nuns migrated down the Nahe to Rupertsberg on the Rhine, where a second convent was built and the remainder of her life was passed.

Hildegard was a woman of extraordinarily strong and original character. The freedom and the terms with which she denounced the great ones of the earth, even the Emperor Frederick Barbarossa himself, as well as the character of her visions, and much of the setting of her life, remind one of a Hebrew prophet. She enters the special field of the history of science by reason of several scientific works that were written by her or have been attributed to her. The "Physica" comprises a collection of the scanty scientific knowledge of the twelfth century, and is of special medical interest as containing a description of the nature and uses of herbs. It is also remarkable for some sound hygienic views. The "Liber Simplicis Hominis" contains scattered throughout its chapters valuable glimpses of physiological conceptions prevalent in Germany in the twelfth century. Another work, the "De

Causis et Curis Morborum," to which Hildegard's name is attached, is regarded by Dr. Singer—contrary to the accepted opinion—as spurious, and probably collected early in the thirteenth century after the death of Hildegard.

The main interest in Hildegard centres round her work "Scivias," a name she herself invented and subsequently declared to be a shortened form of "Scito vias domini." This beautiful composition is full of moving and inspiring passages, and breathes a depth of spiritual understanding rare in any age. Medically, it is specially interesting from the fact that much of the text is presented in the form of visions. These visions are magnificently illustrated in a contemporary manuscript which now reposes at Wiesbaden, and which was almost certainly prepared under Hildegard's own supervision. Dr. Singer has studied this manuscript and has had copies made of some of its miniatures. These he exhibited, and showed that the primary physical basis of the visions was migraine or scintillating scotoma. The miniatures exhibit typical fortification figures, stars and coloured spots, and in some cases a shimmering concentric appearance occupying the whole field of vision. There is also evidence from her writings that Hildegard, who in spite of her active and energetic life had very poor health, was a sufferer from a migrainous affection.

Some of her visions present the interesting phenomenon of reintegration from other visions. In one instance Dr. Singer was able to demonstrate the separate elements out of which such a composite vision had been built.

DISCUSSION.

Dr. HINGSTON FOX, speaking as a personal sufferer from migraine, suggested that the blue colours in the pictures were as important as the red, both these hues, as well as others, being characteristic of migrainous spectra. St. Hildegard's imagination, highly stimulated by spiritual influences, would make her symptoms vivid, and, associating them with heavenly visions, she would fix her attention upon them until they could be depicted in the forms shown.

Dr. RAYMOND CRAWFURD and Dr. LEONARD GUTHRIE also took part in the discussion, and Dr. SINGER replied.

The Medical Aspects of the Greek Anthology.

By J. D. ROLLESTON, M.D.

PART I.

IT is a remarkable fact that a work which was described by that accomplished scholar John Addington Symonds as "from some points of view the most valuable relic of antique literature we possess" should have received so little attention from medical writers. With the exception of our learned member Dr. Iwan Bloch, in that storehouse of medical classical lore "Der Ursprung der Syphilis," as well as in his more recent work "Die Prostitution," no medical historian, to my knowledge, has made any extensive use of the Greek Anthology.

This neglect is all the more surprising as considerable attention has been given to the medical allusions in the Latin writers, especially in Juvenal and Martial. Possibly an explanation is to be found in the fact that the Greek Anthology is not studied in schools or universities, except in carefully selected editions which contain some of the most exquisite poems in Greek literature, but from which the epigrams of medical interest have been omitted, not only on account of their dealing with subjects unsuited for the young, but also from their scant literary value. Further, no complete English translation or complete English edition of the work exists. While acknowledging my indebtedness to Mackail's well-known selection which contains an admirable introduction to the study of the anthology, I have mainly had to rely on F. Dübner and E. Cougny's edition (3 vols., Didot, Paris, 1864, 1872, 1890), which is accompanied by a Latin translation and explanatory notes, and on a French translation of F. Dehéque (Hachette, Paris, 1863). The edition from which quotations are made is the Greek text published by Tauchnitz in three volumes in 1829.

The term "epigram" applied to the poems of the Greek Anthology, like the Latin equivalent "inscription," merely denotes a short poem, in the great majority of cases in the elegiac metre, dealing in a concise manner with any conceivable subject, but without the modern connotation of an unexpected witty termination. Many of the subjects, though set forth in verse, are of a most pedestrian character, but their lack of literary merit is compensated by their medical interest, as well as by the light which they throw on the everyday life of the ancient world

The collection of poems known as the Greek Anthology consists of the Palatine Anthology compiled by Constantinus Cephalas in the tenth century A.D., the Planudean Anthology called after Maximus Planudes, a monk of Constantinople, of the fourteenth century A.D., and an Appendix of some 400 epigrams, of which nearly 300 are anonymous.

The anthologies of Cephalas and Planudes were founded on the collection made by Agathias (500 A.D.), who in turn had incorporated in his anthology three previous collections made by Meleager (end of second century B.C.), Philippus (200 A.D.) and Straton (200 A.D.) respectively. The Planudean compilation was published in 1494 and was the only version of the Anthology extant until the lost MSS. of Cephalas were discovered by Saumaise in the Palatine library at Heidelberg in 1606, though it was not published until nearly the end of the eighteenth and beginning of the nineteenth century, by Brunck and Jacobs. In its present form the Planudean Anthology contains only those poems which are not included in the Palatine collection. The great majority of the epigrams are to be found in the Anthology only, but there are also many which appear in other works, such as those of Herodotus, Diogenes Laertius or Athenaeus.

Apart from the large number of epigrams by utterly unknown or anonymous writers to which it is difficult, if not impossible, to fix a date, the poems of medical interest in the Greek Anthology extend over a period of nearly fifteen centuries, beginning with Empedocles and Simonides in the fifth century B.C., including poets of the Alexandrian epoch in the third century B.C., a large number of writers in the early and late Roman Empire, representatives of the literary renaissance in the reign of Justinian in the sixth century, and ending with Cometas, a contemporary of Cephalas, in the tenth century. The great majority of the medical epigrams, as will be shown, are by writers who flourished subsequent to the establishment of the Roman Empire. In several instances epigrammatists of different date have the same names, thus there were two named Leonidas, two named Automedon, and three named Antipater, and though sometimes they are distinguished by the names of their birthplace, this is not always the case, and difficulty results in assigning a date to the epigram in question.

The cosmopolitan nature of the later Greek culture, to which Symonds in particular has drawn attention, is illustrated by the representatives of these various periods, in whose epigrams matters relating to medicine may be found. From Rome came Lucilius, Nicarchus and Ammianus; from Magna Graecia, Leonidas of Tarentum; from Alexandria, Callimachus and Palladas; from Byzantium, Agathias and Paulus Silentiarius, and from Asia Minor, Straton, Nicias and Nicomedes.

The Palatine collection, which contains the greatest number of medical allusions, is divided into fifteen sections: (i) Christian epigrams by various writers. (ii) A description by Christodorus of the statues in the public gymnasium called Zeuxippus at Byzantium. (iii) Mural inscriptions on the Temple of Apollo at Delphi by an anonymous poet. (iv) The prefaces of Meleager, Philippus and Agathias to their collections. (v) Amatory poems. (vi) Votive epigrams. (vii) Sepulchral poems. (viii) Epigrams of Gregory, the theologian. (ix) Descriptive epigrams. (x) Hortatory epigrams. (xi) Convivial and comic epigrams. (xii) Straton's anthology on Boy Love. (xiii) Poems in different metres. (xiv) Problems, riddles and oracles. (xv) Epigrams on various subjects. Most of the medical epigrams are to be found in sections v, vi, vii, ix, x, xi, xii, and xiv. The first section merely contains allusions to the medical saints Cosmas and Damian (i, 11), and Cyrus and John (i, 90), and a curious medical metaphor by Ignatius (800 A.D.) in an epigram on a picture of the Crucifixion in the Church of the Virgin at the Fountain in Byzantium (i, 111): "Dead Hades vomits forth her dead, having received the flesh of the Lord as a purge." Sections ii and iii contain nothing that concerns us. Meleager, in his preface to his anthology in section iv, wherein he attaches the name of a flower or fruit to each poet in his "garland," gives the graceful and appropriate title of "green mint" to the physician Nicias. In section viii Gregory devotes twenty-six tedious epigrams to the memory of his brother Caesar, court physician to the Emperors Constantios and Julian. Section xv contains only one epigram of medical interest (xv, 19), an abduction by a member of the Asklepiadæ and his condign punishment.

The principal poems of medical interest in the Planudean Anthology are those dealing with the *εἰκόνες* (statues or busts) of Hippocrates, Galen, Iamblichus, Praxagoras, and Oreibasius. The Appendix contains epigrams on votive offerings by the physician Nicias, on baths and springs, premature deaths, epitaphs on the physicians Asklepiades and Agathemenus, and on a child who seems to have suffered from general tuberculosis. Altogether about 400 epigrams in the whole of the Anthology, out of a total of nearly 4,000, deal more or less directly with medical subjects. In the present paper I shall deal only with the doctors of the Greek Anthology, reserving for a subsequent communication the numerous other medical allusions to be found in the work.

At least five of the contributors to the Anthology were medical men—viz., Empedocles, Nicias, Nicander, Nicomedes, and Magnus. Empedocles (flor. 500 B.C.) is the author of two, possibly three, epigrams. Though a legislator and a philosopher as well as a poet and physician, he was guilty of a punning couplet on his colleague, the Sicilian physician Acron. The circumstances are related by Diogenes Laertius (viii, 65). Acron petitioned the senate of Agrigentum for a family burying ground in consideration of his superiority over other physicians (*διὰ τὴν ἐν ἰατροῖς ἀκροτητα*). Empedocles opposed the grant on the principles of equality, and sarcastically suggested the following inscription on Acron's tomb: "Acron, the eminent physician of Agrigentum, son of an eminent father, lies beneath the eminent acropolis of an eminent country." (App., 21.)

Another punning epigram (vii, 508) is attributed to Empedocles by Diogenes Laertius—though, in the Anthology, Simonides appears as the author—on the physician Pausanias, a native of Sicily, to whom Empedocles dedicated his last poem on Nature: "Pausanias, worthy of the name,[1] son of Archytas of the family of the Asklepiadæ, is buried here by his country Gela. Many men wasted by cruel disease he kept from the home of Persephone." The other contribution of Empedocles is a fragment of one of his lost poems dedicated to Pausanias, which shows that, like Pythagoras, he held the doctrine of metempsychosis (ix, 569). Nicias of Miletus (flor. 290 B.C.), a contemporary of Erasistratus and friend of Theocritus, who dedicated to him his ninth idyll, contributed nine epigrams, one of which is on a thank-offering to Eileithuia after childbirth (vi, 270), another is on a corrosive hair dye (xi, 398), and the rest are mainly on pastoral subjects (vi, 122, 127; vii, 200; ix, 315, 564; Anth. Plan., 188, 189). Nicomedes, a physician of Smyrna, of uncertain date, who is himself described in an anonymous epigram as an excellent physician (App., 57), is the author of a reversible epigram on Hippocrates (ix, 53) and of two others on a statue of Asklepius (App., 55, 56).

Nicander (second century B.C.), well known for his often quoted but little read toxicological poems Theriaca and Alexipharmaca, is the author of two epitaphs on fallen warriors (vii, 435, 526). An epigram in the comic section (xi, 7) on man's polygamous instinct, attributed in the Palatine Codex to Nicander, has been assigned with more probability in the Planudean collection to Nicarchus. Lastly, Magnus of Ephesus, physician at the Roman Court and an adherent of the eclectic school, who is himself commemorated by Palladus (xi, 281), has a panegyric on his master Galen (Anth. Plan., 270).

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[1] Derived from *παύειν ἀνίας*, "to relieve suffering."

Probably some of the anonymous epigrams emanated from medical men—e.g., those on Hippocrates (Anth. Plan., 268, 269), Nicander (ix, 211-13), Marcellus (vii, 158), Oreibasios (ix, 199), and Asklepiades (App., 119), the riddles relating to cupping glasses (xiv, 54, App., 117) and rectal syringes (xiv, 29, 55), and some of the poems on baths (especially ix, 606-13, 615-18; x, 112, and App., 304).

Two lengthy dedicatory poems in the Appendix (50, 51) have been attributed by some authorities to Marcellus, physician of Side in Pamphylia. They contain, however, nothing of medical interest and were more probably composed by Herodes Atticus, the tutor of Marcus Aurelius (Dehéque).

The epigrams on medical men in the Greek Anthology may be classified into two main groups:—

(1) Poems of a panegyrical character, sometimes amounting to hyperbole, and chiefly consisting of epitaphs or dedicatory verses.

(2) Satires.

In the first group we may include the epitaphs and other epigrams on the natural philosophers and physiologists who formed one of the principal sources of Greek medicine prior to Hippocrates—viz., Pythagoras (vii, 119-22; x, 46, App., 37; Anth. Plan., 325-26), Anaxagores (vii, 95), Democritus (vii, 56-9; ix, 148), and Heraclitus (vii, 79, 80, 127; ix, 148, 540). With the exception of an epigram on the death of Heraclitus and one on Pythagoras, to which allusion will be made later, they contain nothing of medical interest and need not detain us. Six epigrams relate to Hippocrates, of which four are by anonymous writers, one by the physician Nicomedes and one by Synesius, a writer of the sixth century A.D. One of these is an epitaph (vii, 135, anon.) "Hippocrates the Thessalian, of Cos by race, lies here, born of the immortal stock of Phoebus. He set up many trophies over disease and gained great glory not by chance but by art." Two anonymous poems in the Planudean collection are still more laudatory: "Hippocrates, either Paean wrote your prescriptions or you were the witness of his healing skill" (Anth. Plan., 268). "Hippocrates of Cos the Paean of mortals, was the first to open the hidden paths of the healing art" (*ibid.*, 269.)

In another anonymous poem in the same collection (271) the name of Hippocrates is coupled with that of a veterinary named Sosander, and is one of the many examples of plays on words to be found in the

Anthology: "Hippocrates, physician of men, and Sosander, doctor to horses, both skilled in the secrets of the healing art, change either your profession or your name and do not be called by the name of the profession in which the other excels." The lines on the *εἰκών* of Hippocrates by Synesius relate how one Eusebius, who had been granted the right of an *εἰκών*, had erected one of Hippocrates instead of his own and thereby "gained greater glory" (Anth. Plan., 267). Galen is mentioned but once (Anth. Plan., 270), in an epigram on his statue by Magnus: "There was a time when, thanks to thee, Galen, the earth received men mortal and reared them up immortal, and the halls of lamentable Acheron were empty owing to the power of thy healing hand."

This idea of the physician's depopulating Hades is found again in two other epigrams. One of these is by an anonymous writer (App., 119) at the end of an hexameter poem on Asklepiades: "The physician Asklepiades has gone to the home of the blessed and has left desolation and solitude among the dead." The other epigram is by Crinagoras on the statue of Praxagoras (Anth. Plan., 273), the first physician to give the pulse its due place in diagnosis and therapeutics: "The son of Phoebus implanted in your breast, Praxagoras, the knowledge of the healing art. All the ills which arise from long fevers and the balms to place on the wounded skin, thou hast learnt from his gentle wife, Epione. If mortals had a few physicians like thee, the barque of Charon would not have to cross the Styx."

Other physicians who are commemorated in connexion with their statues are Iamblichus, physician and professor of medicine (*ἰατροσοφιστής*), remarkable for his purity of life and refusal to take fees (Anth. Plan., 272, Leontius), and Oreibasius, the encyclopædist, likened to "a bee gathering honey here and there" (Anth. Plan., 274, anon.). Oreibasius is also mentioned in the descriptive section (ix, 199, anon.): "Fate, owing to the immortal art of divine Oreibasius, in fear often prolonged his span of life."

Other medical writers who are mentioned in the Anthology are Paulus Aegineta, Nicander, and Marcellus of Side. The work of Paulus is commemorated in the following couplet (App., 360, anon.): "My name is Paulus, my country Aegina. After much labour, I put the whole of Medical Science into a single book." Nicander is honoured by three anonymous epigrams in which he is ranked with Asklepius, Chiron, Hippocrates, and Homer (ix, 211-13). An anonymous epitaph on Marcellus, a physician of Side, in Pamphilia (vii, 158), records that his works were placed in the library at Rome by order of Hadrian and his son Antoninus. "Of the forty books of a science worthy of Chiron in which Marcellus discussed in heroic metre the treatment of disease" two considerable fragments remain, entitled Ἰατρικὰ περὶ Ἰχθύων and Περὶ Λυκανθρώπου.

Allusion should be made here to the Christian epigrams on the medical saints. The first of these (i, 11) refers to the medical saints and martyrs Cosmas and Damian, surnamed ἀνάργυροι, because they took no money for their services, and is a prayer addressed to them by Sophia, the wife of the Emperor Justinus, asking for victory over disease and the barbarians. In the other (i, 90), Sophronius, patriarch of Jerusalem, returns thanks to Cyrus and John for being cured of a disease of the eyelids. I have already alluded to Caesar, the Court physician, brother of Gregory the theologian, who commemorates him in seventeen epigrams of no medical interest or literary merit.

Among less known or entirely forgotten medical worthies we find Nicias (vi, 337); Nicomedes (App., 57), "an excellent physician when he was among the living"; Ablabius, ranked as third after Hippocrates and Galen (vii, 559); Claudius Agathemenus (App., 224), the friend of the satirist Persius; Andronicus (App., 339); Philippus (ix, 597); and a certain Asclepiades (not the celebrated one) (App. 174) and his son Verus.

The Anthology contains two references to the Asklepiadæ, or Guild of Physicians, who claimed to be descended from Asklepius. One of them (ix, 675) relates to a lighthouse built by them at Smyrna, where, as we learn from coins, the Asklepiadæ had considerable influence, while the other (xv, 19) is less to their credit, relating as it does an abduction by a member of the guild. Punishment quickly followed by the house falling in and crushing the bridal pair and the wedding guests.

With the exception of a single epigram in Straton's collection (xii, 13) all the satires on medical men are to be found in the eleventh, or comic, section. A sub-section of fifteen consecutive epigrams (112-26), entitled by a commentator εἰς ἰάτρους, is entirely devoted to this subject, the others being scattered throughout the section (xi, 2, 131, 188, 257, 280, 333, 334, 382, 401), making twenty-five in all.[1] Of these, eleven are by Nicarchus, three by Lucilius, two by Callicter and Straton respectively, while Agathias, Ammianus, Hedylus, and Palladas contribute one each. Three are anonymous.

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[1] Most of these have been collected by Witkowski in "Le mal qu'on a dit des médecins," Paris, 1884, who wrongly attributes their translation to F. Jacobs instead of to Dehèque.

With the exception of Hedylus, contemporary of Callimachus (324 B.C.), and of Callicter, who possibly belongs to the same period, all the writers named flourished during the early Roman or Byzantine Empire, and Roman influence is clearly visible in their epigrams, which recall not only the satires of Juvenal and epigrams of Martial, but the even more venomous attack by the elder Pliny on the medical profession in Rome (Hist. Nat. Lib., xxix, cap. i-viii).

The story of the man who dreamed of a doctor and never woke again is told both by Lucilius in the Anthology (xi, 257) and by Martial (vi, 53). As these writers were probably contemporaries, it is impossible to say which was the imitator, or whether they derived their subject independently from a common source. How readily these epigrams lend themselves to translation into Latin is shown by Ausonius (309-394 A.D.), who among many other adaptations from the Anthology has given in his eightieth and eighty-first epigrams (Ed. Teubner) remarkably close versions of two epigrams by Nicarchus (xi, 114, 113) which deal with thievish or murderous practitioners. Of the twenty doctors whose names are given in these satirical epigrams, fourteen are not spoken of by any other writer. At least no mention of them is to be found in Hirsch's "Biographisches Lexicon," or William Smith's "Dictionary of Greek and Roman Biography," in which all the celebrated physicians of antiquity have received notice from Dr. W. A. Greenhill. Possibly these names were fictitious, to prevent reprisals. Of the remaining six, Capiton, Gennadius, Hermogenes, Simon, Theodorus and Zopyrus, none can be identified with certainty, for many physicians of antiquity were so named. Possibly Capiton (xi, 117) may be the oculist whose prescriptions are quoted by Galen and Aetius, and Zopyrus (xi, 124) may be the Alexandrian surgeon who invented antidotes, which he offered to Mithridates and to one of the Ptolemies, but there is nothing to prove the identity of either.

The prevalence of specialists in ancient Rome is well known to us from the descriptions of the Latin poets, especially Martial. The most numerous and thriving class were the oculists, to whom four epigrams in the Anthology refer. The following lines by Nicarchus (xi, 115) recall the equally cruel attacks of Martial: "If you have an enemy, Dionysius, don't call upon him the wrath of Isis, nor of Harpocrates, nor of any god that makes men blind, but invoke Simon, and you will learn what a god can do and what Simon."

Haeser remarks that the medici ocularii would be too highly honoured if they were regarded as ophthalmologists in the full sense. A large section devoted themselves to the composition of eye salves. As many of these contained powerful escharotics, such as copper or arsenic, the following epigram by Straton (xi. 117) is probably founded on fact: "The physician Capiton anointed the eyes of Chryses who could see a town at 8 stades, a man at 1 stade, a quail at 12 cubits, and a louse at two hands' breadth. But now he cannot see a town at 1 stade, nor at 2 plethra the flame of a lighthouse. He can hardly see a horse a hand's breadth off, and where once he could see a quail he cannot now see a large ostrich. If he continue the ointment he won't be able to see an elephant close to him."

An anonymous epigram (xi, 126) satirizes the brutality with which the treatment was carried out. "It was not with a spatula but with a trident that Charinus anointed my eyes, using a sponge fresh from the ink-pot. In taking out his spatula he dragged out my eyelashes by the roots, and the spatula remained in the eye. If he anoints me a second time, I shall not trouble him again for my eyes. For how could I when I have none?"

Dr. Withington instances the frequent defective spelling on the seals which the oculists used for their eye salves as one of the many proofs of their bad education. That their honesty was also defective we learn from the following epigram by Nicarchus (xi, 112): "Before anointing your eyes, poor Demostratos, say farewell to the holy light of day, so sure an aim has Dion, not only did he blind the Olympian victor, but he stole the bright eyes of his statue."

Two other epigrams also allude to a combination of love of the fine arts with swift dispatch of patients. One is by Nicarchus (xi, 113): "The physician Marcus touched the statue of Zeus yesterday, and though it is stone and Zeus, it has gone to-day (like his patients)." In the other epigram, which is by Ammianus (xi, 188), the musical dilettante is satirized, an untranslatable pun being made on the name Apollo, and the Greek word *ἀπολλύναι*, "to slay". "Nicetas when he sings is an Apollo of song, and when he practises of his patients."

In an epigram by Callicter (xi, 333), alluding to the doctor's thievish habits, the double meaning of the Greek word *αἴρει* can be preserved in the translation: "Rhodon removes lepra and scrofula with drugs and everything else without any drugs at all."

I may also mention here an anonymous epigram (xi, 125) describing a compact between a doctor and a grave-digger, whereby the grave-digger supplies the bandages stolen from the corpses, in return for which the doctor sends all his patients to the grave.

Four epigrams are directed against surgeons. In the following two by Nicarchus caustic allusions are made to their orthopædic operations: "Socles having promised to straighten the hump-back Diodorus placed three heavy square stones upon his spine. The humpback was crushed and died, but he became straighter than a rule" (xi, 120). "Agelaus killed Akestorides while operating on him. 'The poor wretch was bound to limp, if he had lived,' said he" (xi, 121). In the two other epigrams on surgeons Lucilius (xi, 131) ranks Hermogenes among the four worst scourges that have afflicted mankind; while Palladas (xi, 280) describes Gennadius as one who after exacting his fee conducts his patients to Hades.

We know from the Oath of Hippocrates that cutting for stone was forbidden to every respectable practitioner, the operation being relegated to professional lithotomists. It is probably to one of these persons that the following taunting epigram (xi, 2) is addressed by Callicter, a poet whose date is uncertain, though he probably belonged to the Alexandrian epoch: "Theodorus, son of Aeschylus, why do these good men attack me? Will you not prevent them? All have stones." Here, again, is an untranslatable pun. The Greek word translated by "prevent" (διακωλύσεις) also suggests cutting open the abdomen (Dehéque).

The readiness and impunity with which doctors kill their patients—a favourite theme for the satirist throughout all ages—are exemplified in most of the satirical epigrams. The mere touch (xi, 114), sight (*ibid.*, 123), thought (*ibid.*, 118), or even dream (*ibid.*, 257) of the doctor might prove fatal. In four epigrams (*ibid.*, 118, 119, 122, 123) in which doctors were the cause of sudden death to their patients, clysters are mentioned, suggesting that their administration was sometimes carried out with excessive unskilfulness or brutality. An anonymous poet stigmatizes Damagoras as outweighing plague in the balance (*ibid.*, 334), and Nicarchus compares another doctor, Zopyrus, to Hermes, the guide to the infernal regions (*ibid.*, 124); but perhaps the wittiest epigram on the wholesale destruction of the sick is one which has been variously attributed to Lucian, Lucilius, and Agathias (*ibid.*, 401). A doctor sends his son to a tutor, but when the boy had learnt the first three lines of the Iliad his father sent him no more, but said this lesson could be learnt at home, as he himself sent many souls to Hades, and for that had no need of a tutor.

Another favourite topic for the medical satirist, the question of the fee, is only found in two epigrams besides the allusion to the surgeon Gennadius already mentioned. One of these, an epigram by Agathias (xi, 382), also gives an amusing picture of the pompous bedside manner and platitudinous utterances of the fashionable physician attending a case of acute bronchitis: "Alkimenes lay sick with fever, his voice hoarse and husky, his side rent as with a sword and breathing rapidly with noisy gasps. Then came Callignotus of Cos, the sententious speaker, full of the wisdom of Paean, able to foretell the issue in every disease and never predicting aught but what will come to pass. He examined the position of Alkimenes, scrutinised his face, wisely touched his hand, and consulted the work on critical days, ruminating all, not far removed from Hippocrates. Then he announced his prognosis to Alkimenes with pompous manner and solemn air. 'If the rattling in your throat and the cruel stabs in your side abate and fever no longer obstruct your respiration, you will not die of pleurisy, for all that is a sign of the recovery that is to be. Take courage, but call a lawyer, put your affairs in order, cease to lead an anxious life, and for my good advice leave me, your physician, a third share in your will.'"

The other epigram (xi, 171), by Lucilius, is the only instance in these satires of the patient over-reaching the doctor: "Hermocrates the miser as he was dying put himself down in his will as his sole legatee. And he reckoned up how large a recompense he would give the doctors if he recovered, and what he was spending by being ill. When he found he would pay a drachma more if he recovered, ''Tis better to die,' he said, and laid himself out."

Though the tone of some of these epigrams seems exaggerated, the satires were by no means uncalled for. The medical profession in Rome during the early Empire was considerably overcrowded. Specialism, the existence of which Cicero had deplored (De Oratore III, c. 33), rapidly spread after his day, as it offered the chances of soon earning a lucrative living at a small cost.

Thanks to the teaching of Themison, and still more to that of Thessalus and the Methodist school, a long preparation for practice was not considered necessary, and the result was the ignorance and incompetence which provoked the satires of Martial and the contemporary writers of the Greek Anthology.

(To be continued.)

Dr. Raymond Crawfurd showed a collection of "Touch Pieces" and gave a short account of their history in connexion with the cure of the King's Evil.

Dr. F. W. Cock exhibited interesting examples of old surgical instruments, included amongst which was a ritual circumcision knife.

Section of the History of Medicine.

December 3, 1913.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

Martial and Medicine.

By Raymond Crawfurd, M.D.

In this short study I propose not to stray beyond the strict limits that its title imposes, and so far as possible to allow Martial to speak for himself in the broken English into which I have had the presumption to endeavour to render his epigrams. I do claim the merit of having adhered with some fidelity to the language of the originals, but beyond this I do not expect even the small measure of appreciation that Martial claims for himself:—

> Sunt bona, sunt quaedam mediocria, sunt mala plura
> quae legis hic: aliter non fit, Avite, liber.
> (Ep. i, 16.)
>
> Some good, some middling, many bad
> you'll find in this edition:
> Avitus, books cannot be made
> except on this condition.

THE LOW STATUS OF MEDICINE IN ROME IN MARTIAL'S TIME.

Martial's epigrams, as a whole, mirror the everyday life of Imperial Rome in the latter part of the first century of the Christian era; the allusions to medicine are not numerous, but such as they are they do afford just those living touches that re-animate the dry bones of medical history, but which are so apt to elude the historian. A profession of medicine can hardly be said to have existed at the time in Rome, though, as the epigrams show, the practitioners were all too numerous.

Though Julius Cæsar[1] had done something to raise the status of medicine by granting civic rights to medical immigrants, and though Augustus and the later emperors had beamed benevolently on their own body physicians, the calling of medicine was still too ignoble for adoption by the Roman of culture and breeding, despite the wealth of a few leading physicians,[2] and was almost exclusively in the hands of foreigners, mostly Greek, or of the less desirable members of the native populace. Men such as these, by their ignorance, their cupidity, their viciousness, their blatant quackery, afford a fair target for the shafts of Martial's satire. It was all "go as you please": no compulsory curriculum, no diploma, no censors' board, no General Medical Council, no barrier of healthy public sentiment to restrain professional obliquity. The great Asclepiades had long since shown that ignorance and effrontery were effective passports to the highest medical eminence. Failing at the Bar, he conceived the idea of exploiting the practice of medicine. Ignorant of the rudiments of medicine,[3] he wisely decided to substitute for the approved stock-in-trade of the *soi-disant* physician those simple methods with which every layman has some acquaintance—physical exercise, bathing, diet, and the judicious selection and liberal administration of the choicest vintages. There was a strong dash of "Larkinism" about Asclepiades: "To hell with the Pharmacopœia" was his attitude towards medical practice. One wonders that such a man should have failed at the common law Bar, but being what he was it was inevitable that the practice of medicine should offer superior attractions and greater scope for his activity.

Though, as I have said, there was no compulsory curriculum, some sort of clinical teaching seems to have been attempted, but, if it was of advantage to the student, according to Martial it brought little comfort to the patient:—

> Languebam: sed tu comitatus protinus ad me
>   venisti centum, Symmache, discipulis.
> Centum me tetigere manus aquilone gelatae,
>   non habui febrem, Symmache, nunc habeo.
> (Ep. v, 9.)
>
> I lay ill: but soon Symmachus sought me
>   with a class of a hundred young men,
> whose hundred cold paws have brought me
>   the fever I lacked till then.

---

[1] Suetonius, "Julius Cæsar," xlii.

[2] Pliny, "Natural History," xxix, 5.

[3] "Natural History," xxvi, 7.

The Bane of Pretentious Specialism.

Specialism may be the measure of the excellence of medicine at any period, but it may be also the reverse. In Martial's time it was assuredly the measure of the degradation of the healing art: here is an enumeration of some of those who preyed on the vitals of Imperial Rome:—

Totis, Galle, iubes tibi me servire diebus
  et per Aventinum ter quater ire tuum.
Eximit aut reficit dentem Cascellius aegrum,
  infestos oculis uris, Hygine, pilos:
Non secat et tollit stillantem Fannius uvam,
  tristia servorum stigmata delet Eros.
Enterocelarum fertur Podalirius Hermes:
  qui sanet ruptos dic mihi, Galle, quis est.
(Ep. x, 56.)

Gallus, I'm at your service all the day
  trudging the Aventine three times each way:
Cascellius draws bad teeth or does repairs,
  Hyginus burns from eyelids worrying hairs.
A knifeless Fannius docks lax uvulas,
  Eros removes from slaves degrading scars:
Hermes, like Podalirius, ruptures cures:
  Who, Gallus, heals an injury like ours?

That "ruptos" should not be rendered "ruptured," as most translators have done, is clearly shown by the context of the previous line, and there is little doubt that Martial indicates a condition arising from the malpractices which were prevalent at the time in Rome, and which figure *ad nauseam* in his epigrams. The word "tollit," with its varying shades of meaning, leaves some doubt as to the exact nature of the treatment which Fannius meted out to relaxed uvulas, but it suggests that then, as now, man was impatient to discard his superfluities. The uvula has always presented the same irresistible temptation to the budding laryngologist as the appendix to the young surgeon, and other savages, as you know, inflict similar mutilations on their own ears and noses. Can it be that Fannius employed the cautery, which Hyginus used in the treatment of entropion, or is the allusion to some escharotic or to an écraseur? On the other hand, the word may simply indicate the use of some astringent which raises up the trailing uvula, and this view is supported by the fact that Celsus recommends local astringent applications, in preference to the knife, in any case of acute congestion, such as might induce copious hæmorrhage.

Here, then, are mentioned dentists, oculists, laryngologists, dermatologists, and hernia specialists, of some of whom we shall have something to say hereafter. Martial is not alone in denouncing the bane of the pretentious specialism prevalent in his time, as we find Scribonius Largus, physician to Emperor Claudius, inveighing against those who undertake the cure of isolated diseases, whereas the true physician should be able to cure all.

Many epigrams deride the competence or the character of these manifold practitioners. Here are typical examples:—

> Clinicus Herodes trullam subduxerat aegro:
> deprensus dixit: "Stulte, quid ergo bibis?"
> (Ep. ix, 96.)
>
> Doctor Herodes filched a bowl
> from a sick patient's table:
> when caught, he merely said "You fool,
> to drink you are not able."

And this pair, and many others in similar strain:—

> Chirurgus fuerat, nunc est vispillo Diaulus.
> coepit quo poterat clinicus esse modo.
> (Ep. i, 30.)
>
> Diaulus undertook of late
> the operator's art:
> but now prefers to operate
> the undertaker's part.

> Nuper erat medicus, nunc est vispillo Diaulus,
> quod vispillo facit, fecerat et medicus.
> (Ep. i, 47.)
>
> Diaulus held till recently
> the office of physician,
> but now in strict conformity
> a gravedigger's commission.

The distinction between the clinical physician and the operating surgeon is thus clearly recognized. The term "medicus" is of much wider application than "clinicus," and the nearest English equivalent is to be found in the title "apothecary"; he might be a mere druggist, or he might actually practise medicine, but his status was, speaking generally, inferior to that of the "clinicus."

OCULISTS.

Oculists come in for a full measure of Martial's satire: like Diaulus, they were prone to descend in the social scale :—

> Oplomachus nunc es, fueras ophthalmicus ante:
> fecisti medicus quod facis oplomachus.
>
> (Ep. viii, 74.)
>
> Though once an oculist, you now replace
> your lancet by the gladiator's lance:
> the change of weapon makes no difference,
> you still administer the coup de grâce.

For lack of English equivalents it is impossible to reproduce the play on the words "oplomachus" and "ophthalmicus," so I have endeavoured in my translation to transfer it to the instruments of their respective callings. Here is a skit on the oculist's skill :—

> Solvere dodrantem nuper tibi, Quinte, volebat
> lippus Hylas, luscus vult dare dimidium.
> Accipe quam primum: brevis est occasio lucri:
> si fuerit caecus, nil tibi solvet Hylas.
>
> (Ep. viii, 9.)
>
> Blear-eyed Hylas yesterday
> to pay your fee was willing:
> now one eye is gone he may
> halve the previous shilling.
>
> Quintus, take it greedily,
> profit by the occasion:
> when he's blind, he'll certainly
> try complete evasion.

In contrast to this it is pleasant to encounter an oculist who was prompt to denounce the injurious habits of his patient; we may label the epigram "Albuminuric Retinitis."

> Potor nobilis, Aule, lumine uno
> luscus Phryx erat alteroque lippus.
> huic Heras medicus "Bibas caveto:
> vinum si biberis, nihil videbis."
> Ridens Phryx oculo "Valebis" inquit.
> misceri sibi protinus deunces
> sed crebro iubet. Exitum requiris?
> Vinum Phryx, oculus bibit venenum.
>
> (Ep. vi, 78.)
>
> Aulus, there's Phryx that fine old winebibber,
> blind of one eye and of the other blear
> his doctor Heras said, "Drop alcohol
> for if you take it you'll not see at all."
> Laughing Phryx wished his eyes a last "Good-bye"
> and ordered cups to be mixed frequently.
> d'you want to know the consequences? why
> 'twas wine to Phryx, but poison to his eye.

We learn from Martial that artificial eyes were beyond the ophthalmic science of his day.

> Dentibus atque comis—nec te pudet—uteris emptis.
> quid facies oculo, Laelia? non emitur.
> (Ep. xii, 23.)
>
> False teeth and hair flaunts Laelia shamelessly.
> but not false eyes, for these she cannot buy.

Doubtless the repelling spectacle of the empty orbit, at a time when diseases of the eye flourished unrestrained by the simplest antiseptic remedies, must have been only too common in Rome. And worse than this, where now we employ sedatives, the practice then was to use irritants and strong astringents:—

> Aspicis hunc uno contentum lumine, cuius
> lippa sub adtrita fronte lacuna patet.
> (Ep. viii, 59.)
>
> You see that fellow yonder, how
> he swaggers with a single eye:
> while underneath his shameless brow
> there gapes a sightless cavity.

DENTISTS AND DENTISTRY.

Dentists and dentistry figure prominently in Martial's epigrams. Apparently domestic remedies for aching teeth and for other simple dental disorders fell within the province of the general medical practitioner. Celsus, who, though not himself a medical man, compiled the leading medical text-book of the time, devotes a good deal of space to the teeth. He has a legion of medicinal remedies for the relief of toothache, most of which are to be applied directly to the aching tooth. Similar applications are recommended for the aching of carious teeth, but he lays down no lines of treatment for dental caries, if unattended by pain. Extraction is his resource, when topical applications fail to relieve the pain. He advocates making teeth that have become loose fast, by means of gold wires binding them to those that are firm, but the real conservative dentistry was left in the hands of dental charlatans. Pliny[1] speaks of these men cauterizing carious teeth with ignited walnut shells. Scribonius Largus[2] does mention scraping away the carious matter of a decayed tooth as though it were an orthodox medical procedure, but Andromachus, whom Nero raised from being his own body-physician to that of archiater, or physician-in-chief, had no better remedy for caries than packing the cavity with the theriaca, or treacle, which he invented as a general panacea, and which maintained its ancient reputation right down to modern times. If this was the treatment to which Andromachus subjected his imperial master, it affords perhaps some explanation, if not an excuse, for those wild outbursts of passion that darkened the life of Nero. Dentists indeed seem to have been more successful in stopping the tooth than the ache, for Pliny[1] cites, in most matter-of-fact language, the case of a man who threw himself from the top of a house after having a hollow tooth stopped with laser and wax: and he adds, by way of comment: "It is a well-known fact that, if this is rubbed on the muzzle of a bull, it irritates him to an extraordinary degree." A visit to the dentist in those days was not a thing to be lightly undertaken, for according to Pliny again "it is beneficial to introduce into hollow teeth the ashes of the dung of mice, or of the dried liver of lizards." Celsus makes no mention of artificial teeth, and to judge from the various allusions by Martial, it would seem that they were worn rather to improve the appearance than to aid mastication.

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[1] "Natural History," xxiii, 77.

[2] "De Compositione Medicamentorum," x.

> Thais habet nigros, niveos Laecania dentes:
> quae ratio est? Emptos haec habet, illa suos.
> (Ep. v, 43.)
>
> Laecania has white teeth, Thais brown;
> How comes it? One has false teeth, one her own.

Other epigrams describe the composition of these false teeth :—

> Nostris versibus esse te poetam
> Fidentine, putas cupisque credi?
> sic dentata sibi videtur Aegle
> emptis ossibus Indicoque cornu.
> (Ep. i, 72.)
>
> You, Fidentinus, court a poet's crown
> by passing off my verses as your own:
> so Aegle counterfeits reality
> with teeth of bone and Indian ivory.

And again :—

> et tres sunt tibi, Maximina, dentes,
> sed plane piceique buxeique.
> (Ep. ii, 41.)
>
> Three teeth has Maximina, all of which
> are plainly boxwood, and as black as pitch.

---

[1] "Natural History," xxii, 49.

Archæologists have shown, by recovered specimens, that these artificial teeth of ivory, bone, or boxwood, were generally fixed by wiring them to adjacent firm teeth. Guerini suggests that the Romans learnt this procedure from their Etruscan neighbours, and not from Greek immigrants. Mention of gold for binding the teeth together is found in the Law of the Twelve Tables, composed by the Decemviri at Rome in 450 B.C., whereas the influx of Greek physicians into Rome did not commence till near the end of the third century B.C. Moreover, many examples of this gold work have been found among Etruscan remains. But there is at least a suggestion in Martial that something of the nature of artificial dentures was also worn, for he says:—

> Nec aliter dentes quam serica nocte reponas.
> (Ep. ix, 37, 3.)

Teeth that could be laid aside at bedtime as readily as the clothing cannot have been fixed with wires, and must almost necessarily have been worn on some form of movable denture. Guerini claims to have identified one of the period, but his exposition does not seem to me very convincing.

THE CARE OF THE TEETH.

The care of the teeth is another fertile subject for Martial's wit. Toothpicks and dentifrices assume a special prominence. The favourite material for toothpicks was lentisc wood, which was believed incidentally to exert a favourable pharmacological action. Galen, for example, recommends holding in the mouth warm oil of lentisc to relieve pain due to disease of the gums.

> Lentiscum melius: sed si tibi frondea cuspis
> defuerit, dentes pinna levare potest.
> (Ep. xiv, 22.)
>
> From lentisc sticks the best toothpicks
> are made, but should they fail,
> a feather's quill as surely will
> to ease thy teeth avail.

Pliny is more explicit on the subject of quill toothpicks: he says that picking the teeth with the quill of a vulture turns the breath sour, while a porcupine's quill makes them firm. A passage of Petronius, in which he describes a toothpick as "spina argentea," shows that they were sometimes made of silver, and Roman toothpicks of gold, of pre-

Christian times, have also been unearthed. A toothpick and an earpick, to which latter Martial alludes in the following epigram, have also been discovered combined in a single instrument:—

> Si tibi morosa prurigine verminat auris,
> arma damus tantis apta libidinibus.
> (Ep. xiv, 23.)
>
> If thine ear chance to trouble thee
> with creeping irritation,
> an instrument we guarantee
> to stop such titillation.

Earpicks had either a spatulate end or a flat head, like a small coin, set at right angles on the end of a shaft.

Roman non-medical writers make constant mention of dentifrices, showing how greatly the Romans esteemed the appearance of the teeth. Pliny recommends cleaning blackened teeth by rubbing them with burnt nitre. Even the medical writers extol the dentifrice. Celsus says that stains of the teeth should first be scraped and then rubbed with a dentifrice. Scribonius Largus, who describes many dentifrices, seems to regard them, as Martial does, as intended to preserve the beauty rather than the health of the teeth. From him we learn that calcined stag's horn was one of the ingredients of the tooth-powder used by Messalina, the wife of the Emperor Claudius, so that the calcareous constituents of modern tooth-powders have an ancient pedigree. Galen, in the following century, recommends special medicaments and dentifrices for restoring the whiteness of the teeth, and recognizes much more than Celsus and Scribonius Largus that they are also useful to keep the teeth free from disease. To Martial, however, the dentifrice is an item of the repertoire of the beauty specialist. In this epigram the dentifrice addresses some aged hag:—

> Quid mecum est tibi? me puella sumat:
> emptos non soleo polire dentes.
> (Ep. xiv, 56.)
>
> I'm not for thee: on use of me
> only a maiden ventures:
> I have no wish to give polish
> to artificial dentures.

MASSAGE, DRUGS, &c.

Massage flourished in Rome, and then as now proved attractive for other than its legitimate uses. It was practised both by men and women, but the masseuse chiefly seems to have made a fine art of its abuse—*corruptio optimi pessima.* Seneca says that he would rather thrust his hand into the fire than submit it to the manipulations of a rubber of either sex. One epigram alludes to massage as an accessory of the luxuries of the table :—

> Stat exoletus suggeritque ructanti
> pinnas rubentes cuspidesque lentisci
> et aestuanti tenue ventilat frigus
> supina prasino concubina flabello.
>
> * * * * *
>
> percurrit agili corpus arte tractatrix
> manumque doctam spargit omnibus membris.
> (Ep. iii, 82.)
>
> Toothpicks in hand a minion stands and gives
> red feathers, when his master's stomach heaves:
> when hot, beside him lies a courtesan
> to waft fresh coolness from a leek-green fan.
> A masseuse nimbly o'er his body skims
> and makes deft passes over all his limbs.

The red feathers of the flamingo were used to excite vomiting.

Now and again Martial gives us a peep into the armamentarium of the practising physician. He shows us his ivory medicine chest :—

> Artis ebur medicae narthecia cernis : habebis
> munera quae cuperet Paccius esse sua.
> (Ep. xiv, 78.)
>
> Here's a medicine-chest you see
> all made out of ivory :
> in this present you'll acquire
> all that Paccius could desire.

He names also some of the drugs in common use ; here are some remedies for constipation :—

> Utere lactucis et mollibus utere malvis :
> nam faciem durum, Phoebe, cacantis habes.
> (Ep. iii, 89.)
>
> Use mallows and use lettuces
> that soften defaecation :
> for you present the facies
> of chronic constipation.

Lettuces enjoyed a great vogue in Roman medicine. Antonius Musa was said to have saved the life of the Emperor Augustus by a diet of lettuces, and received in return a huge fee, a gold ring, and a public statue adjacent to that of Æsculapius.

Here is an anticipation of Carlsbad plums:—

Pruna peregrinae carie rugosa senectae
  sume: solent duri solvere ventris onus.
(Ep. xiii, 29.)

Try prunes, they're sold wrinkled and old,
  brought from some foreign nation:
they'll be of use in setting loose
  thy belly's constipation.

Next we have some lines addressed to a girdle, which remind us of their former uses in obstetric practice:—

Longa satis nunc sum: dulci sed pondere venter
  si tumeat, fiam tunc tibi zona brevis.
(Ep. xiv, 151.)

Now I'm long enough, but when
with delicious tension
burdened is thy belly, then
I shall need extension.

AN EPITAPH ON A CHILD.

It should be borne in mind that Martial possessed no medical knowledge, and correspondingly we find in his epigrams no living pictures of disease, but these tender lines on the death of little Canace seem to suggest that the child died of cancrum oris:—

Aeolidos Canace iacet hoc tumulata sepulchro
  ultima cui parvae septima venit hiems.
ah scelus, ah facinus! properas qui flere, viator,
  non licet hic vitae de brevitate queri;
tristius est leto leti genus: horrida vultus
  apstulit et tenero sedit in ore lues,
ipsaque crudeles ederunt oscula morbi
  nec data sunt nigris tota labella rogis.
Si tam praecipiti fuerant ventura volatu
  debuerant alia fata venire via.
Sed mors vocis iter properavit eludere blandae,
  ne posset duras flectere lingua deas.
(Ep. xi, 91.)

Here lieth Aeolis' daughter Canace,
Her seventh winter was her last. ah me!
Ah cruel shame! haste by, and shed no tears,
Traveller, lamenting her brief span of years.
Sadder than death death's fashion; a foul growth
Made ravenous session on her tender mouth,
Consuming it, and left no lips entire
To lavish kisses on the funeral fire.
If fate must needs swoop down in headlong flight
It should have come to her in gentler plight.
Death sped to close her gentle voice's gate,
So that it might not bend relentless fate.

In this epitaph Martial is seen at his best: the language and the sentiment are chaste and tender, and stand out in arresting contrast to the gross obscenity of so many of his epigrams. It is not the only epigram in which he shows his real love of children, a characteristic which perhaps he brought with him from Spain, where the fondness lavished on children is surpassed only by the cruelty inflicted on animals. Martial's foulness is no basic feature of his mind. He desired above all things to be popular, and to this end he supplied his readers with the sort of garbage they desired, but at the same time has made atonement to posterity in the exceeding fitness of his diction and the grace and variety of his metres.

MALINGERING.

In several epigrams Martial holds up the malingerer to ridicule. Disease is only too apt to be simulated for the sympathy it excites and the service it exacts, and in Rome there was the additional incentive of congratulatory presents on recovery, to increase its prevalence.

Aegrotas uno decies aut saepius anno,
  nec tibi sed nobis hoc, Polycharme, nocet:
nam quotiens surgis, soteria poscis amicos,
  sit pudor: aegrota iam, Polycharme, semel.
(Ep. xii, 56.)

You're sick ten times or oftener every year,
though yours the sickness we the suffering bear;
at each recovery for gifts you call,
Fie! Polycharmus: sicken once for all.

Another feigns infirmity for his stomach's sake:—

Leniat ut fauces medicus, quas aspera vexat
  adsidue tussis, Parthenopaee, tibi,
mella dari nucleosque iubet dulcesque placentas
  et quicquid pueros non sinit esse truces.
At tu non cessas totis tussire diebus.
  Non est haec tussis, Parthenopaee, gula est.
(Ep. xi, 86.)

To soothe Parthenopaeus' cough, which serves to make
  his throat the seat of chronic irritation,
his doctor orders honey, kernels, and sweet cake,
  and all that weans small children from temptation;
It's not to ease his throat, but for his stomach's sake,
  Parthenopaeus coughs without cessation.

Another simulates gout in his own person, just as a later generation invokes the legitimate uncertainty of a wife's health under the inexorable pressure of social necessity.

> Discursus varios vagumque mane
> et fastus et have potentiorum
> cum perferre patique iam negaret
> coepit fingere Caelius podagram,
> quam dum volt nimis adprobare veram
> et sanas linit obligatque plantas
> inceditque gradu laborioso—
> quantum cura potest et ars doloris!
> desit fingere Caelius podagram.
> (Ep. vii, 39.)
>
> When Caelius could no longer tolerate
> the pompous salutations of the great,
> and morning calls and runnings in and out
> he came perforce to counterfeiting gout.
> While he exhibits such excess of zeal
> to prove his artificial sufferings real,
> with bandages and ointments plastered thick
> on healthy feet, supported by a stick—
> (how trickery and brooding magnify
> our ailments!) —: Caelius ceased to act a lie.

Another man is well enough to plead, but not to pay:—

> Litigat et podagra Diodorus, Flacce, laborat:
> sed nil patrono porrigit: haec cheragra est.
> (Ep. i, 98.)
>
> Diodorus, while he sues in court,
> on gouty feet can stand:
> but when his lawyer's bill is brought,
> the gout sets fast his hand.

GOUT AND OTHER SUBJECTS.

Gout seems to have been exceedingly common in Rome, if we may judge from the frequency of its mention in Martial. On this point we have the evidence of his elder contemporary Pliny,[1] who says, "Gout used to be an extremely rare disease, not in the time of our fathers and grandfathers only, but even within my own memory." No doubt the increased frequency was referable to the excessive indulgence in rich foods and in wine, in place of the frugal simplicity of earlier years. In one of his epigrams Martial seems to hint at the importance of purin bodies as a precursor of gout, and recognizes its association with hepatic inadequacy :—

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[1] "Natural History," [illegible] 64.

> Mullorum leporumque et suminis exitus hic est,
>   sulphureusque color carnificesque pedes.
> (Ep. xii, 48.)
>
> Of hares, and mullet, and sow's teat,
>   What's the termination ?—
> bilious colour and the feet
>   racked with inflammation.

Another epigram touches the fringe of very recent pathology, for Martial explains the phenomena of acquired tolerance, which according to ancient tradition was conspicuously displayed in the person Mithridates, King of Pontus :—

> Profecit poto Mithridates saepe veneno
>   toxica ne possent saeva nocere sibi :
> tu quoque cavisti cenando tam male semper
>   ne posses umquam, Cinna, perire fame.
> (Ep. v, 76.)
>
> By poisonous doses of increasing strength
>   the king of Pontus gained immunity :
> so Cinna by low feeding can at length
>   confront starvation with impunity.

Pliny[1] says that, after the defeat of Mithridates, Pompey found in his private cabinet the recipe for his antidote in his own handwriting : "Take two dried walnuts, two figs, and twenty leaves of rue : pound them together with the addition of a grain of salt : if a person takes this mixture fasting, he will be proof against all poisons for that day." Galen[2] says that Marcus Aurelius used the prescription regularly.

Martial vies with Herrick in the number of epigrams he devotes to the unsavoury subject of bad breath. Here is a sample :—

> Quod nullum calicem tuum propinas
>   humane facis, Horme, non superbe.
> (Ep. ii, 15.)
>
> That Hormus does not pass the wine
>   he's tasted to the company
> Is not of arrogance a sign,
>   but only mere humanity.

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[1] "Natural History," xxiii, 77.

[2] "De Antidotis," I, 1.

In these Martial fails, with Herrick, to rise above his subject; but Herrick for once has contrived to impart to his "Jone and Jane" a degree of daintiness worthy of a better theme.

ALCOHOLISM.

In several epigrams Martial jibes at the futile efforts of the alcoholic to disguise the odour of the breath by means of perfumes, and incidentally he depicts the alcoholic facies in the one that follows. It contains also a covert allusion to those poetasters who seek inspiration by eating bay leaves, and to bring out this *double entente* I have translated "bibit" as "chews."

> Fetere multo Myrtale solet vino,
> sed fallat ut nos, folia devorat lauri
> merumque cautâ fronde, non aquâ, miscet.
> Hanc tu rubentem prominentibus venis
> quotiens venire, Paule, videris contra,
> dicas licebit, "Myrtale bibit laurum."
> (Ep. v, 14.)

> Though redolent of wine she yet deceives
> our nostrils with the odour of bay leaves,
> 'tis these, not water, that her wine receives.
> As often as you see her, all ablaze
> with starting venules on her flaming face,
> approaching you, say "Myrtale chews bays."

Rome was familiar also, as we are, with that other type of alcoholic facies that suggests the appearance of a waterlogged suet pudding. Pliny[1] describes it: "From wine comes that pallid hue, those drooping eyelids, those sore eyes, those tremulous hands, unable to hold with steadiness the overflowing vessel," and so on.

And here we must part company with Martial.

[1] "Natural History," xiv, 28.

Medical Aspects of the Greek Anthology.

By J. D. ROLLESTON, M.D.

PART II.[1]

IN my previous paper on the medical aspects of the Greek Anthology I dealt with the medical men connected with it either as contributors or as the subjects of the poems. In the present communication I shall enumerate the other medical allusions to be found in the work—viz., to medicine and religion, puerperal mortality, deaths at different ages, causes of death, acute and chronic infections, especially possible references to malaria, tuberculosis, and syphilis, alcoholism and other intoxications, gout, digestive disorders, latrines, baths, cosmetics, deformities, dwarfs and giants, diseases of nervous system and special senses, and veterinary medicine.

MEDICINE AND RELIGION.

Asklepius, the tutelary god of medicine, is mentioned in twelve epigrams. In two of them, both by Diogenes Laertius (vii, 108-09), as healer of the body he is contrasted with Plato, the healer of the soul. A single line by an anonymous writer (ix, 673) is an obscure allusion to a service rendered by Asklepius to Hippolyte, Queen of the Amazons. In an epigram by Crinagoras (Anth. Plan., 273), Asklepius and his wife Epione are mentioned as having instructed the physician Praxagoras in the healing art. The remaining eight epigrams relate to his temple worship and are to be found either in the votive section or in the Appendix. The first of these that deserves quotation is an anonymous couplet (App., 99) preserved by Clement of Alexandria (Strom., iv), who says that it was inscribed on the Temple of Asklepius at Epidaurus: "It is meet for him who enters the temple to be pure; now to be pure is to have holy thoughts." In other words, the ceremonial purification required of every visitor to the shrine of Asklepius was not sufficient. A pure heart was also needed. Another epigram (vi, 330), attributed to Aeschines, the orator, relates how after suffering from a wound in his head a whole year and having lost hope in mortal aid he recovered in three months after a visit to the shrine of Asklepius.

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[1] For Part I see *Proceedings*, pp. 3-13.

The well-known description in the Plutus of Aristophanes (665, *et seq.*) has made us familiar with the trickery of the priests in the Temple of Asklepius. The following lines by Callimachus (vi, 147) suggest that they were not over-scrupulous in demanding payment for services that had already received recognition and show that the prayers addressed to Asklepius, as to other Greek deities, were, as Girard points out, essentially of a mercantile nature :—

"Thou knowest, Asklepius, that thou hast received the payment of the debt which Akeson contracted for his wife Demodike. But if it be forgotten and thou demandest payment again, this tablet says it will bear witness."

The Temples of Asklepius, especially that at Athens, were remarkable for the number of statues that had been offered by grateful worshippers. A graphic description of a visit to the temple at Cos by two women and their slaves and of their naïve amazement at the beauty of the statues is given in the Mimes of Herodas (M., iv), a work which resembles the Anthology in its vivid portrayal of the everyday life of the ancient world. Four epigrams in the Anthology record the consecration of statues to Asklepius after recovery from illness. Three of these are of special interest as the offerings were made by men who were themselves physicians. One of these was Nikias, the friend of Theocritus (vi, 337), and the other Nikomedes, physician of Bithynia (App., 55, 56). The third epigram (App., 322) commemorates the consecration of a statue by a certain Valens after recovery from a painful illness. Lastly, mention should be made of an epigram (App., 162) on a brazen urn broken by the frost in a temple of Asklepius at Panticapæum.

In addition to those concerning Asklepius, about twenty epigrams illustrate the relation of medicine to religion. Thus we find a prayer offered to Artemis on behalf of a sick emperor (vi, 240, Philippus), probably Augustus (Dehéque), a thanksgiving to Isis for the recovery of a sick child (vi, 150, Callimachus), and a punning couplet by Simonides (vi, 216) to Zeus Soter, offering the thanks of Sosos and his wife Soso for their recovery.

In several epigrams ex-votos are mentioned. A lamp "rich in twenty wicks" is offered to Serapis by a mother for her child (vi, 148, Callimachus), an aged woman after recovery from lameness leaves her stick with the nymphs of Ætna (vi, 203, Philippus), and an old debauchee presents his perfumes, pomades, coloured raiment, and false hair to Priapus (vi, 254, Myrinus).

Three other epigrams in the votive section would be equally in place in the comic—viz., one by Lucilius on a sailor who on escape from shipwreck dedicated an image of his enormous hernia which had served as a lifebelt (vi, 166), another by Eratosthenes on a drunkard who offered an empty wine-cask, which was all he had, to Bacchus (vi, 77), and the following epigram by Antipater (vi, 291):—

> "Bacchylis, who drains the cup of Bacchus to the dregs, when lying sick uttered these words to Deo: 'If I escape this wave of destructive fever, until I have seen a hundred suns I will drink dew water without a drop of wine.' On the day she was free of her sickness she devised this ruse. Taking in her hands a sieve she saw through it more than a hundred suns."

Ten of the epigrams in the votive section are of an obstetrical nature, three being prayers addressed to Eileithuia or to Here for an easy labour (vi, 146, 244, 273) and seven (vi, 200-02, 270-72, 274) thanksgivings accompanied by ex-votos for safe delivery. The offerings consisted of locks of hair and various portions of feminine attire, as will be seen from the following epigram by Marcus Argentarius, who probably flourished under the Emperor Hadrian:—

> "Sandals and a fair ribbon and a perfumed lock from her lovely hair and a girdle and a delicately woven skirt and beautiful bands that bind the breast Ambrosia offers with joyful heart to Artemis after escaping from the burden of childbed" (vi, 201).

PUERPERAL MORTALITY.

That a high puerperal mortality existed in classical antiquity is suggested by the large number of epigrams on women who died in childbed, chiefly by poets such as Dioscorides, Leonidas and Antipater of Sidon, who flourished in the second or third centuries before the Christian Era. Three relate to cases of multiple birth; in the first, both twins die with the mother (vii, 166), in the second, the mother dies, but the triplets survive (vii, 168), and in the third one twin survives and the other dies with the mother (vii, 465). Other epigrams record the child's dying with the mother (vii, 464) or following her ten (vii, 729) or twenty days (vii, 167) later to the grave. In six epigrams (vi, 163-67, and App., 384), three of which are on the same woman, the mothers' ages are given as 18, 22, and 34 respectively. With the exception of the following epigram by Dioscorides (vii, 167), which relates to a primipara, in all the epigrams in which details are given the women had already borne one or two children (vii, 163-65, 464-65; App., 384).

"Call me, Polyxena, the wife of Archelaus, daughter of Theodektes and ill-fated Demarete, a mother only by my fatal childbed, for a god carried off my child who had barely seen 20 dawns, and at 18 I died, but recently a bride and mother, having had in all but a short life."

A remarkable instance of high puerperal mortality in one family is given in the following epitaph by Leonidas (vii, 463):—

"Here lie Timoclea, Philo, Aristo, and Timetho, daughters of Aristodicus, all slain by birth pangs. Their father raised this monument over them and then died himself."

The following lines from an anonymous epigram (App., 384) are remarkable for the description of death due to *ante-partum* hæmorrhage, though whether the hæmorrhage was accidental or due to placenta prævia there is, of course, nothing to show.

" . . . The cruel unforeseen disaster of a loss of blood robbed me of my pleasant life and that of my babe. The infant had not yet been born, but lay hidden in its mother's womb. I had not passed my 34th year, leaving a male lineage of two boys to my beloved husband."

An accouchement during an earthquake is thus described by Antiphilus of Byzantium (vii, 375), a poet of the Augustan age:—

"The house was shaken and fell upon me, but my bedchamber remained firm, the walls standing upright. As I cowered beneath them the pangs of travail got hold on me and I added another terror to the earthquake. Nature herself was my midwife and both of us escaping from the ruins beheld the sun's light together."

This epigram figures among the sepulchral poems, in which it appears out of place—[temere inter ἐπιτύμβια receptum, says a commentator]—but, as we have already seen, is by no means an isolated example of epigrams being ranged in inappropriate sections in the Anthology.

Deaths at Different Ages.

Numerous epigrams both in the sepulchral section and in the Appendix commemorate the deaths of infants and young children. A case of dead-born twins is thus described by Palladas (ix, 189), a cynical Alexandrian poet of the fourth century A.D., and the most prolific contributor to the Anthology :—

> "A grammarian's daughter after the delights of love brought forth a masculine, a feminine, and a neuter."

None of the other epigrams except those already alluded to, in which the mother died as well, relate to infants born dead, but are epitaphs on children aged from 10 months and upwards. Their ages in months or years are almost invariably recorded, but in only eight epigrams is the cause of death mentioned. In four it is given as drowning from falling into a well (vii, 170), or from a ship into the sea (vii, 303), or through the ice of a frozen river (vii, 542; ix, 56). A pathetic epigram by Diodorus (vii, 632) describes a fatal fracture of the spine in a little slave child from falling off a ladder. In another epigram it is uncertain whether the child's death was due to a fall from a plum tree or to a surfeit of its fruit (anon., ix, 483). An epigram in the Appendix (257), to be alluded to below, suggests that general tuberculosis was the cause of death. Premature and unexplained deaths of adults from 16 to 30 are commemorated in many anonymous epigrams in the Appendix (125, 148, 152-53, 166, 200, 209, 233, 305-06, 332, 381), while deaths at a later period are mentioned in only a few, of which the following may serve as an example :—

> "Here lie I Dionysius aged 60 of Tarsos, never married; would that my father had not" (vii, 309).

Lastly there are one epigram on a nonagenarian (App., 388) and two on centenarians. One of the latter relates to the father of Gregory, the theologian, who died at the age of 100 (viii, 12), and the other (vii, 224) to the following unique case of a woman remarkable for her fertility, longevity, and vigour :—

> "I, Callicrateia, the mother of 29 children, have not seen the death of either son or daughter, but have completed 105 years without supporting a trembling hand upon a staff."

CAUSES OF DEATH.

In many of the epitaphs no explanation of the death is given. Among those in which a cause is assigned various forms of violence take a prominent part. Of six relating to suicide three are on a soldier who stabbed himself that the disease might not boast it had killed him, (vii, 233, Apollonides; 234, Philippus; ix, 354, Leonidas); one is on a voluntary ante-mortem burial (vii, 336, anon.), one by poisoning by aconite (vii, 107, Diogenes Laertius), and the last on a man who jumped from a roof after reading Plato's Phædo (vii, 471, Callimachus), "whether from curiosity or perplexity or a sense of the comparative vanity of earthly things" (Neaves).

Certain epigrams deserve notice for relating deaths which may be ranked among the curiosities of medicine, such as that of a fisherman choked by a fish leaping down his throat (vii, 504, Leonidas; 702, Apollonides), of a singer choked by a fig (ix, 488, Tryphon), of a child decapitated by falling through a hole in the ice, the body being swept away by the current (vii, 542, Flaccus; ix, 56, Philippus), and of an adulterer punished by the rectal insertion of a radish (ix, 520, anon.). Other epigrams illustrate the irony of fate, such as that of the undertaker's assistant (vii, 634, Crinagoras) crushed by the coffin he was carrying, and that of the philosopher Heraclitus, "who had deprived life of all its moisture" and then died of dropsy (vii, 127, Diogenes Laertius). There is also a grim humour in the following anonymous epigram (ix, 67):—

> "A young man hung a garland on the column of his stepmother's tomb, thinking that in death her character had changed. But the column fell on the tomb and killed the young man. Children of a former marriage, beware your stepmother's grave."

ACUTE INFECTIONS.

Though the vagueness of description natural to poetic composition makes it impossible to identify with certainty any definite acute infection, the prevalence of epidemic disease is often indicated. The legend of Niobe and the slaughter of her fourteen children by Apollo and Artemis, which probably arose, as Boccaccio pointed out long ago, from the occurrence of some pestilence, has inspired many epigrams (vii, 386, 530, 549; Anth. Plan., 129-34), and there are several other examples of high familial mortality, of which the following epigram by Apollonides may be quoted:—

> "Who is there who has not endured the extreme misfortune of losing a son? But the house of Poseidippus buried all four, whom Hades carried off in as many days, robbing him of all hope of children, and the father's sorrowing eyes became extinct in grief. Now a common tomb covers them all" (vii, 389; cf. also vii, 471).

Two other epigrams on many deaths in a single family are to be found in the ninth section. In the first (254), by Philippus, a mother whose three children had died adopts another and loses it also; in the second (390, Menecrates) the mother, after the death of her first three children, puts her fourth alive upon the funeral pyre (cf. also App., 160 and 170). In two epigrams the word λοιμός (pestilence) is used, but, as Haeser remarks, it would be difficult to apply this term to any definite epidemic disease. In one quoted in my previous paper (xi, 334) a doctor, Damagoras, is described as outweighing pestilence in the balance. The other (vii, 241), by Antipater of Sidon (100 B.C.), is on the death of a Ptolemy who had been carried off by a pestilence which ravaged Egypt. Possibly this may refer to diphtheria, which was known in antiquity as Egyptian or Syriac ulcer, the classical description of which is to be found in Aretaeus (De ac. morb., i, c. ix, Adams's ed., Syd. Soc., p. 255). Another possible allusion to diphtheria in the Anthology is to be found in a punning epigram (xi, 129) by Ceralius, a writer of unknown period, relating how a poet competing at the Isthmian games complained of a sore throat (παρίσθμια).

Malaria.

The prevalence of malaria in ancient Greece, to which Mr. W. H. S. Jones has drawn special attention, induced me to make a careful search for any possible references to it in the Anthology. In view of Mr. Jones's contention that after Aristophanes (400 B.C.) the word πυρετός (fever) in non-medical literature always means malaria, I have collected all the passages in which this word or ones with similar meaning occur. Some of them are extremely vague, as in the following comic epigram by Lucilius (xi, 311):—

> "Pantaenetus was so lazy that when he was feverish (πυρέξας) he prayed every god he might never rise again. And now, in spite of himself, he leaves his bed, blaming the deaf ears of the unjust gods."

A possible reference to malaria is furnished by the circumstances connected with the celebrated couplet (ix, 685):—

> "Touch not Camarina, it is best left untouched. Beware lest in touching it from greater you make it less."

This was the response given by an oracle to the inhabitants of Camarina who consulted it as to the wisdom of draining a marsh which rendered the town unhealthy. In spite of this prohibition the lake was drained, and the town was rendered accessible to the enemy who took it. The period at which this event occurred is unknown, but the possibility of malaria being the cause of the town's unhealthiness naturally suggests itself. A similarly vague allusion is to be found in the epigram by Antipater (vi, 291) on the alcoholic woman Bacchylis quoted above. There is a more definite reference to malaria in an epigram already alluded to (Anth. Plan., 273), by Crinagoras (first century A.D.), in which Praxagoras is said to have knowledge of the sufferings arising from long fevers. Malaria is here probably indicated, as a protracted course is characteristic of malarial infection.

The following anonymous epigram (ix, 141) also refers to malaria, as lethargos and phrenitis, which were both described by Hippocrates, were well-recognized forms of this disease.

"A lethargic and a phrenetic by lying in the same bed cured each other's disease. For the phrenetic leaped from the bed and smote the lethargic with repeated blows. These blows were for both a cure, for one was wakened and the other cast into a sound sleep by fatigue."

Comic as this may sound, it was scarcely a caricature of treatment once in vogue, as is shown by the following quotation from Aretaeus on the cure of lethargics:—

"If deep sleep prevail, shouting aloud, angry reproach, threats regarding those matters he is accustomed to dread, announcement of those things which he desires and expects, everything to prevent sleep, the reverse of that which is proper for phrenetics." (Treat. of Acute Dis., Lib. i, c. ii, p. 387, of Adams's ed., Syd. Soc.)

Similarly Caelius Aurelianus (De ac. morb., ii, c. vii, par. 33) condemns Diocles for ordering sternutatories, frictions and pungent drinks for lethargics (cf. also Celsus, iii, xx, De lethargo et ejus curatione.)

Animal Parasites.

The use of bugs in quartan intermittent recommended by Dioscorides (ii, 36) is alluded to in the following epigram by Palladas (ix, 503) —

"Not without reason did I say that there was a divine power in bugs (διζύφοις). For yesterday I applied one to a man who had long been suffering from quartan fever and he became suddenly well like a Crotoniate (οἷα κρότων ὑγιής)."

The text of his passage appears to be very corrupt. According to Dehéque the word *δίζυφον*, which is not to be found in Liddell and Scott, is probably a synonym of *κρότων*, a bug. In that case *ὑγίης οἷα κρότων* should be translated "sound as a bug," colloquially "fit as a flea."

Mr. Jones, to whom I submitted this and other passages in the Anthology relating to malaria, informs me that among the ignorant peasants of Calabria at the present day a favourite remedy for malaria is a pill of spider's web, one of the numerous instances of crude opotherapy that has existed in all ages.

It is noteworthy that several epigrams allude to mosquitoes. Thus Meleager aptly described them as blood-suckers (*αἵματος ἀνδρῶν σίφωνες*) and bids them leave his mistress and feed upon himself (v, 151). Two epigrams (ix, 764-65) by Paulus Silentiarius and one by Agathias (*ibid.*, 766), who both flourished under Justinian, are on mosquito nets, and show that they were used to protect the sleeper in his midday nap.

Other disease-conveying insects mentioned in the Anthology are fleas and lice, the references to which are all of a broadly comic character. Thus we have a punning epigram by Parmenion, a poet of the first century B.C. (ix, 113), on the predatory habits of fleas, and a couplet by Lucilius (xi, 432) on the fool who when bitten by fleas put out the lamp with the words, "Now you cannot see me."

Two allusions are made to the *Pediculus capitis*. One is in the following riddle (xiv, 19), which according to Buttmann's interpretation refers to this parasite:—

> "Once I saw an animal running on its back straight through a wood cut by steel and with its feet it did not touch the earth."

The other is on a philosopher's unkempt beard, which is described as "a source of lice and not of wisdom" (xi, 156, Ammianus).

Tuberculosis.

Unless the examples of high mortality in families alluded to above are to be regarded as deaths from tuberculous infection the references to tuberculosis in the Anthology are very vague and scanty. The terms *φθίσις* and *φθισικός* merely refer to wasting disease without indicating its nature. Thus in an epigram by Palladas (x, 54) we read:—

> "Phthisis is not the only cause of death, but excessive fatness has often produced the same result. Of this Dionysius tyrant of Heraclea who suffered this is witness."

An epigram by Diogenes Laertius (vii, 115) on the cynic philosopher Antisthenes says that he died *φθισικός*, and Ammianus, in a poem which seems singularly out of place in the comic section (xi, 13), ranks wasting with fever and dropsy among the various modes of death. A more definite reference, however, to tuberculosis is in an epitaph by an anonymous writer in the Appendix (257), which suggests a general tuberculosis:—

"My father brought me up giving me my mother as a nurse and I grew up beloved by all. But in a short time the decrees of the fates were accomplished for they confined me to my bed with a cruel disease in my two [here a word is missing, but the word *νέφρους*, 'kidneys' has been suggested, while others think that disease of the testes is indicated]. But my father with perseverance cured me by himself alone and thought that thereby he had pacified fate. But another cruel disease took hold upon me, far worse than the first, for decay attacked the bones of my left foot. Then my father's friends incised it and took away the bones. And then I recovered from this disease as from the first. But even then cruel fate was not satisfied, for it brought upon me another disease in the belly, causing the bowels to swell and making me waste everywhere else until at last my mother's hands closed my eyes. Such, stranger, have I suffered in the term of my short life."

Syphilis.

The question of the existence of syphilis in classical antiquity has been exhaustively discussed by Dr. Iwan Bloch, who quotes freely from the Greek Anthology in support of his contention that the disease was unknown to the ancients. There is, indeed, Rosenbaum notwithstanding, nothing suggestive of syphilis, or indeed of any venereal disease, in the Anthology. This is the more remarkable as two sections, the fifth and the twelfth, dealing with normal and homosexual relations respectively, are entirely devoted to erotic poems, and many of the epigrams are conspicuous for the frank presentation of the physical side of sexual life. Had syphilis been known to the ancients there would undoubtedly have been some reference to its phenomena in the eleventh or comic section.

Apart from the epigrams relating to homosexuality[1] and other sexual aberrations (v, 105, Argentarius; v, 207, Asklepiades; xi, 108, anon.; 218-23, Crates, Antipater, anon., Ammianus, Meleager), in which latter, I may say in passing, there is nothing to indicate syphilitic infection, the only pathological sexual phenomenon mentioned is impotence, temporary or senile (v, 47; xi, 29, 30; xii, 11, 174, 216, 240), which is treated in the same satirical spirit as in Ovid or Martial.

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[1] The twelfth section of the Palatine Anthology, compiled by Straton (flor. 100 A.D.) and known as the **Μοῦσα Παιδική**, contains 258 epigrams, 93 of which are by Straton himself, on boy-love, and kindred epigrams are to be found scattered throughout the Anthology, especially in the fifth and eleventh sections. Only eight (xii, 6, 7, 15, 33, 41, 206, 210, 219), six by Straton and two by Meleager, are of a proctological character, but these as well as others

The normal phenomena of sexual life, on the other hand, are illustrated by numerous epigrams—e.g., a cento from Homer by Leon the philosopher and emperor (flor. 886-911 A.D.) on defloration recalling the well-known compilation of Ausonius from Virgil (ix, 361), an erotic dream (v, 2, anon.; 243, Macedonius), a cynical allusion by Palladas to the origin of man's life (x, 45), an epigram by Rufinus recalling the aphorism, "omne animal post coitum triste" (v, 77), a large phallus (xi, 21, Straton; 224, Antipater; xii, 242, Straton), and a riddle on the scrotum (xiv, 43, anon.).

Among the epigrams on Priapus of special interest are those in which as tutelary god of gardens he threatens thieves with pædicatio as a punishment (Anth. Plan., 237, Tymnes; 241, Argentarius; 243, Antistius). As Bloch remarks in speaking of the Carmina Priapeia, this would have been the place to have threatened syphilis as a punishment had it been in existence, but neither in the Greek nor the Latin poems is there any suggestion of the kind.

ALCOHOLISM.

Numerous epigrams relating to this subject are to be found not only in the eleventh section, the first sixty-two epigrams of which are called "convivial" (συμποτικά), but also in the sixth, seventh and ninth sections and in the Appendix. Several epigrams show the unpopularity of the water-drinker (e.g., ix. 305; xi, 20, 31, 309, 429). In an epigram by Macedonius (xi, 61), a doctor who forbade his patient wine and bid him drink water is blamed "as a windy fool for not knowing Homer's saying that wine brings strength to mortals." Wine among the Greeks was generally diluted; in a poem by Evenus, a contemporary of Agathias (xi, 49), a mixture with three parts of water is advised. A

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which indicate the existence of male prostitution (xii, 6, Straton; 44, Glaucus; 212, 214, 239, Straton), are sufficient to prove that the pæderasty of the Greeks was not of a purely platonic character. Examination of these epigrams shows nothing suggestive of syphilitic disease. Several epigrams in the Anthology, as in Martial, shows that pæderasty co-existed with normal sexual activity (v, 65, anon.; 116, Argentarius; ix, 241, Antipater; xii, 86, Straton; 90, anon.), so that the term homosexual should here be replaced by that of bisexual. For further details the works of Bloch, Symonds, and P. Stephanus should be consulted.

mythological explanation of the dilution of wine is offered by Meleager in the following epigram (ix, 331):—

> "When Bacchus as a child escaped from the fire and was still covered with ashes, the nymphs washed him, therefore is Bromius dear to the nymphs, and if you keep him from them, you will find that he is still a burning fire."

To drink wine pure was regarded as a barbarism (Bekker), though several deaths, including those of the philosophers Arcesilas (vii, 104), Lacydes (vii, 105), and Chrysippus (vii, 706), are mentioned as due to this cause (vii, 454; xi, 409; App., 361). In this connexion we may note the epitaph by Diogenes Laertius on the philosopher Heraclitus, describing how he who had drained life of all its moisture died of dropsy (vii, 127). The stories connected with the life of Heraclitus are probably apocryphal, or we might be tempted to attribute his dropsy to alcoholic cirrhosis. In some cases death followed overdrinking at a banquet, either from a chill (vii, 660; App., 68, 275) or from falling into the sea from a rock (vii, 398) or a ship (vii, 625). The exciting or depressing action of wine, according to its strength, upon the sexual impulse (xi, 49; xii, 135), its stimulus to poetic composition (App., 28), and its revelation of a person's true character (xi, 232), are illustrated in various epigrams. It is noteworthy that nearly a dozen epigrams by writers whose dates range from the third century B.C. to the second century A.D. relate to female wine-bibbers (vi, 291; vii, 329, 353, 384, 455-57; xi, 297-98, 409; App., 31). Alcoholism, as Iwan Bloch has shown in his recent work, was as closely associated with prostitution in classical antiquity as it is to-day. The following lines by Hedylus (App., 31), a writer of the third century B.C., is an excellent illustration of this association:—

> "Callistium, who rivals men in drinking—'tis marvellous but true—drank 3 choai [about 17 pints] fasting. For this Paphian goddess she has dedicated to thee this vessel of bright glass perfumed with pure wine. Protect her ever, so that thy walls thanks to her, may bear the spoils of her loves."

Bloch has shown that alcoholism was especially liable to develop with advancing age in the hetairæ and prostitutes of antiquity. It is therefore interesting to note that four of the epigrams in question apply to old women (vii, 353, 384, 455, 457). The following example may be quoted, which affords at the same time a striking illustration of alcoholic fabrication:—

> "When the garrulous old Aristomache who loved Bacchus far more than he was loved by his nurse Ino had reached the sacred land below, and her

throat was all parched through want of the wine-cup, 'Minos,' she cried, 'bring me a light pitcher that I may draw water from Acheron, for I too (like the Danaids) have slain a young husband.' This lie she told that even among the dead she might gaze upon a wine jar (vii, 384, M. Argentarius).

Another epigram on the association of lying with drunkenness is to be found in the Appendix (199):—

> "Elis is drunken and lies. As is the house of one, so is the whole city."

Before leaving the subject of alcoholism reference should be made to an epigram of the Emperor Julian (flor. 331-363 A.D.), which shows that beer recently imported by the Celts was taking the place of wine:—

> "Who art thou? Whence comest thou, Bacchus? For by the true Bacchus I know thee not. I know only the son of Zeus. He smells of nectar, and thou stinkest of the goat. Doubtless from want of grapes the Celts made thee of grains of corn" (ix, 368).

POISONS.

Aconite is mentioned in a punning epigram by Diogenes Laertius (vii, 107):—

> "Eurymedon priest of Deo was going to accuse Aristotle of impiety but he escaped by drinking aconite. This indeed was to vanquish without a struggle (*ἀκονιτί*) an unjust accusation."

Hemlock is spoken of in two epigrams, in one by Diogenes Laertius in connexion with the death of Sokrates (vii, 96) and in the other (vii, 470) by Meleager in reference to the habitual suicide of old men in the island of Cos by drinking hemlock.

Bites inflicted by snakes, scorpions, or spiders, to the treatment of which so much attention is given by Paulus Ægineta (Book V), were the occasion of several epigrams (vii, 113, 172, 578). Paulus Silentiarius (v, 266) refers to the current belief that a man bitten by a mad dog sees in the water the image of the dog that has bitten him. Of special interest is the following epigram by Erycius, a writer of the second century A.D. (ix, 233), for its mention of amputation for gangrene, and the employment of an artificial leg:—

> "While cutting down a dry old tree, unhappy Mindon, a hidden spider bit you in the left foot, springing up from below. And black gangrene devoured down to the bone the livid flesh. Your strong leg was cut off, and now one of your limbs is the branch of a tall olive."

Five anonymous epigrams relate to poisonous waters—a favourite subject for the fanciful writers of antiquity—and serve as curious examples of popular superstitions. Cold springs in particular possessed an evil reputation, as the following two epigrams show :—

> "If any one fear to hang himself and desires death let him drink of the cold waters of Hierapolis" (ix, 392).

(Hierapolis was celebrated in antiquity for its warm springs, but its Plutonium, which was a deep cave with a hollow opening, was reputed to give forth a mephitic vapour which poisoned anyone who inhaled it. Possibly the cold waters mentioned in the epigram were connected with this cave.)

> "The stream of cold water issuing from this source is pleasant to drink, but the mind of him who drinks it is turned to stone" (App., 193).

It is noteworthy that Pliny, in his description of poisonous waters (Hist. Nat., xxxi, c. 19) attributes the deadly properties of the River Styx in Arcadia to its excessive coldness. Another deadly water was that of Dium in Macedonia.

> "The water of Dium is a sweet drink. When you have drunk it you will be freed of your thirst and straightway of your life" (App., 253).

On the other hand, a fountain of Cleitor in Arcadia, sacred to the nymphs, though safe to drink of was dangerous to bathe in, especially after drinking wine (App., 100). This mysterious fountain is also mentioned by Ovid (Metamorph., xv, 322) and Pliny (Hist. Nat., Lib. xxxi, c. 2) as being one of which those who drank lost for ever their taste for wine. The following epigram is perhaps the most interesting :—

> "Stranger, you see a deadly water, a man may wash his hands therein without harm, but if you take the clear water into your belly, sipping but a drop, the same day your front teeth will fall from the sockets, leaving the gums bereft of their adornment" (App., 373).

Well water has been accused more than once of producing similar symptoms. Thus Pliny (Hist. Nat., Lib. xxv, c. 6) describes a disease called by the physicians of the time "stomacace," which broke out in the army of Germanicus after drinking of a spring of sweet water. In the space of two years he says their teeth dropped out and the joints of their legs became paralytic. Many centuries later the scorbutic gangrene described by Bretonneau ("Memoirs on Diphtheria," New Syd. Soc., p. 8) among the soldiers of the legion of La Vendée was attributed to well water.

Gout.

The references to gout merit special attention, as next to alcoholism, with which in the minds of the ancients it was so closely associated, it is the most definite disease mentioned in the Anthology. Though it can be traced back as far as Hippocrates (Aphor., vi, 28, 30) it does not appear to have become very prevalent until the end of the Roman Republic. Most of the epigrams alluding to it are of a late date. The earliest, which is by Hedylus who lived at the court of the Ptolemies in 300 B.C., well expresses the current view on the causation of the disease.

"Of Bacchus Lysimeles (i.e., loosener of limbs) and Aphrodite Lysimeles is born a daughter Podagra Lysimeles" (xi, 414).

More than four hundred years later Lucian, who was also the author of a burlesque entitled Tragodopodagra, contributed the following epigram (attributed in the Tauchnitz edition to Lucilius) :—

"Goddess who hatest poverty and alone can vanquish wealth, how truly thou knowest the art of living well. Thy pleasure is to walk with the feet of others and to breathe perfumes, thou rejoicest in garlands and the draughts of Bacchus, things which are never found with the poor. Therefore dost thou shun the threshold of poverty and delightest in coming to the feet of wealth" (xi, 403).

The expression "walking with the feet of others" is also found in an epitaph by Diogenes Laertius (vii, 112) on the peripatetic philosopher Lycon (flor. 272 B.C.).

"No, by Zeus, we will not forget Lycon, whom gout killed, but what I marvel at most is that he who could only walk with the feet of others traversed in a single night the long road to Hades."

From the time of Hippocrates all ancient writers held that sexual indulgence was a great predisposing cause of gout. An epigram by Straton (xii, 243) shows that pæderasty was credited with the same effect. An epigram by Ammianus probably refers to a debauchee :—

"At last gout has overtaken one who deserved it, one who should have been gouty 100 years before" (xi, 229).

The last reference to gout is an anonymous couplet addressed to death (App., 196) :—

"Thou hast come sweeter to me than life for thou hast freed me from disease, toil and hateful gout."

ALIMENTARY DISORDERS.

A certain number of epigrams may be conveniently classified under this heading. The first of them that deserves quotation is by Crinagoras (vi, 229), who flourished in the first half of the first century A.D., on the gift to a friend of a toothpick which in its origin and colouring seems to have been almost identical two thousand years ago with that in use at present.

"The sharp end of the wing of an eagle with crooked beak, cut with a knife and dyed a dark purple, suited for removing with its gentle point anything which after a meal lies between the teeth, a modest gift but offered with affection Crinagoras gives to thee Lucius" (cf. Martial's epigram on Dentiscalpium, xiv, 22).

The abstention from animal diet inculcated by Pythagoras provoked the following protest from Diogenes Laertius (vii, 121):—

"You are not the only one to keep his hands from living things, Pythagoras. We do so too. But when it is roasted and cooked and salted, then we eat what has no longer life."

Frequency of oral sepsis and digestive disturbance generally is suggested by a number of epigrams on foulness of the breath, which was all the more likely to attract attention owing to the prevalence at Rome of kissing as a mode of salutation, even by comparative strangers, as we learn from two epigrams of Martial (vii, 95; xi, 98; Ed. Teubner, 1896; cf. Anth. Pal., xi, 219, 220, 252). This unsavoury subject was a favourite theme for the Roman satirists, and the six epigrams in the Anthology relating thereto were all written by Lucilius or Nicarchus, who more than any other of the poets in the Anthology show the effect of Roman influence (xi, 239-42, 415, 427). One example will suffice, which in its wealth of similes recalls two of Martial's epigrams (iv, 4; vi, 93):—

"Not the chimæra of Homer, nor the herd of oxen breathing fire, nor the whole of Lemnos, nor the dejections of the Harpies, nor the putrid foot of Philoctetes smell so foully, so that all agree, Telesilla, that you surpass the chimæra, the ulcers, the oxen, the Harpies, and the inhabitants of Lemnos" (xi, 239, Lucilius).

There is no justification for the view maintained by Rosenbaum in his work "Die Lustseuche im Alterthume" that this foul breath indicated syphilitic lesions within the mouth, though possibly, as Bloch has suggested, it may have been due to stomatitis following buccal coitus.

Gluttony being a vice abhorred by the Greeks of the classical period, the numerous epigrams relating thereto are directed against barbarians and Romans of the Byzantine epoch. Mention should first be made of anonymous epigram on Sardanapalus, King of Assyria (vii, 525):—

"I possess in remembrance only what I have eaten and drunk and loved. All the rest of my happiness is departed."

An epitaph which Aristotle said "was more worthy of the grave of a bull than of the tomb of a king" (Cic. Tusc., v, 35). Simonides of Cos has a similar epigram on Timocreon of Rhodes (vii, 348), a fellow poet celebrated alike for his satirical and gastronomic prowess.

The following three epigrams by Agathias, who flourished under Justinian, are of special interest not only for their realistic description of the effects of over-eating, but also for their mention of public latrines which had been built at Smyrna under the supervision of Agathias himself. The first runs as follows:—

"All the luxury of the table and costly food is excreted here and has lost its former attractiveness. For the pheasants and minced meats and artfully disguised dishes become excrement here and the belly rejects what the hungry throat received and at last man learns his folly in having bought rubbish for so much gold" (ix, 642).

"Why do you groan for the aching in your head and bitterly lament the pain in your limbs? Why do you strike your belly with repeated blows, thinking to squeeze out the results of your gluttony? There would not have been need of so much effort if at the feast you had not gorged yourself far more than was needed. But as you lay on the couch you were proud and delighted your mouth with food, thinking that that was happiness, and now you suffer here and your belly which you strike so often alone atones for the sins of your throat" (*ibid.*, 643).

The last epigram (*ibid.*, 644) contrasts the easy defæcation of the poor countryman with the ineffectual efforts of the rich.

Three epigrams seem to allude to chronic dyspepsia. Two of these are by Palladas, the bitterness of whose verse may have been due to this cause. In one epigram he asks for *conditum* or spiced wine, "For they say the disease in my stomach needs this drink" (ix, 502). In the other he "shames his shameless belly with solid arguments" (ix, 170). The third epigram is by Lucilius (xi, 165), who describes the miser relieving his stomach-ache by his coins instead of by pennyroyal (γληχών).

In dealing with the satirical epigrams on medical men, I referred in my first paper to the sudden death of patients being associated with the administration of clysters. Rectal syringes are referred to in two of the riddles, from one of which it seems that they were made of a goat's skin fitted with an ivory nozzle (xiv, 29, 55).

The remaining epigrams relating to the digestive system are a riddle on the anus (App., 180), a scatological pun by Palladas on the name of a certain Gessius (vii, 683), and a poem by Nicarchus which recalls the monologue on crepitus in Flaubert's "Tentation de Saint Antoine" (xi, 395).

BATHS.

The important part played by baths in the ancient world, and especially among the Romans, is illustrated by the large number of epigrams (forty-four) devoted to this subject. Thus there are thirty-eight in the ninth section alone (606-40, 662, 783-84), one in the tenth (112), two in the eleventh (243, 411), two in the Planudean collection (280-81) and one in the Appendix (304). Twenty-two are by anonymous writers, and the rest, with the exception of one by Nicarchus (xi, 243), are by contemporaries of Justinian—viz., Paulus Silentiarius, Agathias, Leontius, John of Barbucala, Democharis, Macedonius, and Marianus. The therapeutic virtues of the bath are extolled in an anonymous epigram (App., 304), as follows:—

> "The bath is the cause of many blessings. It removes the humours, dissolves the thickness of the phlegm, empties excess of bile from the bowels, eases painful itching, sharpens the eyesight, cleanses the ear passages of the deaf, strengthens the memory, removes forgetfulness, clears the mind, makes the tongue more active, and purifies and lightens the whole body."

The baths might be small (ix, 611-12, 614, 784), and not hold more than the number of the Graces (ix, 609, 638). Such small baths might be attached to a large public one (ix, 621). Two epigrams by Agathias refer to the large public thermae. In one of them he speaks of the bath being supplied with a hot spring (ix, 630), the other contains a description of the baths of Agamemnon near Smyrna (ix, 631). Another epigram by the same writer (ix, 662) commemorates the transformation of public latrines into baths:—

> "Once I was in a place hateful to behold separated into many places by walls of mud. Here the bellies of foreigners, citizens, and country folk poured their refuse with a loud noise. But Agathias, father of the city, by a change has made enviable what was once most dishonoured."

A similar transformation by Alexander, pontiff of Nicæa at Praenetus in Bithynia, is described in an anonymous epigram (Anth. Plan., 281).

During Homeric times the hot bath was popular, but later, especially in the time of Aristophanes (Nubes, 1045) it was regarded as unmanly and was replaced by cold affusions. Warm baths, however, came again into favour, as we learn from four epigrams, two by Byzantine writers (ix, 627, Marianus; 630, Agathias), and an anonymous one in which hot baths are mentioned, as well as by the following lines on a cold bath (ix, 617, anon.):—

> "Bath man! who built a wall round this river? who has given this fountain the false name of bath? Aeolus son of Hippotas dear to the immortal gods has come here to dwell. Wherefore do these sandals lie here? Surely not for the heat, but for the snow. This is a place for shivering and chill, inscribe upon it, 'Bathe here in the summer only, for within Boreas doth blow.'"

In another epigram, on the other hand, the bath man is blamed for overheating the bath so that the room deserves the name of a funeral pyre (xi, 411, anon.)

An anonymous epigram (ix, 640) shows that special times were allotted to bathers according to their social position:—

> "The immortals (i.e., the emperor) bathe here when the bath opens, and at the fifth hour the demi-gods (i.e., the courtiers), and afterwards the vulgar."

The same bath was sometimes used in common by men and women, as we learn from an epigram on a statue of Hermaphroditus which had appropriately been placed in a bath of this kind (ix, 783, anon.). Owing to the disorders which followed the practice, mixed bathing was forbidden by Trajan, Hadrian, and Marcus Aurelius, but their edicts do not seem to have been rigidly enforced. An epigram by Paulus Silentiarius, who flourished under Justinian, speaks of a bath in which the sexes were divided by a small barrier (ix, 620).

The close association between public baths and prostitution, to which Iwan Bloch has drawn special attention, is illustrated by several epigrams in the Anthology (v, 82; ix, 621-22). The well-known Latin verse:—

> "Balnea vina Venus corrumpunt corpora nostra"

finds an echo in the following couplet in the tenth section (112, anon.):—

> "Wine, baths and love inspired by the Cyprian, speed men to Hades by the swiftest path."

Three anonymous epigrams furnish an instructive commentary on these lines. From two we learn that female attendants were present in the male baths, or were offered as a special attraction without further fee to bathers (v, 82; ix, 622), while the third shows that a crowd of admirers used to wait for prostitutes at the doors of the baths (ix, 621).

COSMETICS.

The art of cosmetics, which is so frequently mentioned by the Roman poets, especially Ovid, Horace, Juvenal, and Martial, provides material for numerous satirical epigrams (v, 19; vi, 254; xi, 66-9, 310, 370, 374, 398, 408), mainly by contemporary Greek writers such as Antiphilus, Myrinus, or Lucilius, or later poets such as Macedonius or Rufinus. They are mostly addressed to women, probably courtesans, who were endeavouring to repair ravages of time. Seven of these, of which the following is an example, relate to hair dyes or false hair:—

"Some say you dye your hair, Nicylla, the hair which you bought of the best black at the market" (xi, 68, Lucilius).

False hair steeped in nard is offered by an effeminate man with his pomade box and face paint to Priapus (vi, 254, Myrinus). In another epigram we read of hair dyed the colour of fire being used by a woman, who also employed charcoal for outlining non-existent eyebrows (xi, 66, Antiphilus). An epigram by the physician Nikias (xi, 398) suggests that the sufferer had been given a depilatory in mistake for a hair dye. The ancient depilatory, as we learn from Paulus Ægineta (iii, sect. 52), was composed of arsenic and quicklime.

"A man on dyeing his head lost all his hair, and he who once had a thick mane became like an egg. This much good did the dyer do for him. No barber need cut his hair again be it white or black."

Face paints, such as chalk, honey, white lead, charcoal, and a seaweed which supplied a red tint, are mentioned in seven epigrams (vi, 254; ix, 139; xi, 66, 310, 370, 374, 408).

Two epigrams by Lucilius may be quoted, which in the brutality of their tone recall the eighth and twelfth epodes of Horace:—

"You have bought hair, rouge, honey, wax, and teeth. At the same cost you could have bought a face" (xi, 310).

"You dye your head but you will never disguise your old age nor straighten out the wrinkles in your cheeks. Don't cover your face with paint so as to have a mask and not a face. For it avails nothing. Why are you so foolish? Paint and dye won't make Hecuba a Helen" (xi, 408).

DEFORMITIES.

The Anthology contains many caricatures of local or general deformity, all the work of writers subsequent to the establishment of the Roman Empire. An epigram by Crinagoras (vii, 401), which recalls Homer's description of Thersites (Il., ii, 212), well exemplifies the Greeks' detestation of physical ugliness, combined with the Roman coarseness of expression :—

> "Beneath this sterile soil the tomb hides the bones of a hated man, pressing upon his loathsome head, deformed chest, stinking range of teeth, slavish legs, and bald forehead, the half-burnt ashes of Eunidicus full of green pus. Earth unhappy in thy bridal lie not lightly but with all thy weight upon his abhorred ashes."

This hatred of physical deformity was partly due to the feeling that there was a corresponding mental and moral defect, as the following epigram by Antiochus (xi, 412) shows :—

> "It is difficult to paint the soul, it is easy to represent the body, but with you it is just the reverse. For Nature externalizing the deformity of your soul has made it visible, but the deformity of your shape and the hideousness of your body how could anyone paint, when they don't wish to look at it ?"

A similar thought is to be found in an anonymous epigram :—

> "You are lame in mind as in your leg, for Nature reveals externally the image of your inner self" (xi, 273).

The anonymous epitaph (vii, 676) on Epictetus, "maimed in body and poor as Irus but dear to the immortals," is the only instance in the Anthology in which a physical infirmity is not satirized.

Chivalry was unknown in antiquity, and with the exception of the beautiful epigrams by Plato (vi, 1) and Julian of Egypt (vi, 18-20), on Lais in her declining years, the descriptions of women grown old and ugly, of which I have already quoted some examples, show the same pitiless realism in the Anthology as in Horace and Martial (v, 204, Meleager; xi, 201, Ammianus; 327, Antipater).

Among local congenital deformities large noses have always proved an attractive theme for the caricaturist. Twelve epigrams on this subject are to be found in the Anthology, three being by anonymous writers (xi, 203, 267-68), two each by Leonidas (xi, 199, 200) and Palladas (xi, 204, 255), and one each by Lucilius (xi, 405), Nicarchus (xi, 406), Theodorus (xi, 198), and the Emperor Trajan (xi, 418)—i.e., all late writers. The following examples of their humour may be given:—

"Hermocrates is a part of his nose, for if we say that his nose is part of Hermocrates we give a small name to a big thing" (xi, 198, Theodorus).

"The house of Xenogenes was on fire and in vain he sought to escape from the window by tying to it a long pole. But at length he espied the long nose of Antimachus, and placing on it a ladder he escaped" (xi, 200, Leonidas).

Six epigrams, all by Lucilius (xi, 75-8, 81, 258) relate to the deformities produced by boxing. When we realize that the boxing gloves of the ancients consisted of thongs of leather studded with large iron nails, and recall the boxing contests in Homer (Il., xxiii, 1685) and Virgil (Aen., v, 400, *et seq.*), the following epigrams will scarcely seem extravagant:—

"Olympicus whom you see in this state, Sebastus, once had a nose, skin, eyebrows, ears, and eyelids, but in boxing he lost all, even his inheritance of which he could have no share. For his brother who had his portrait brought it to the court, and he was judged to be a different man, having no resemblance with the portrait" (xi, 75).

"When Odysseus returned safe to his country his dog Argus alone recognized him, but after four hours' boxing, Stratophon, no dog nor fellow citizen could recognize you. If you look at yourself in a mirror you will say 'I am not Stratophon'" (*ibid.*, 77).

In five epigrams, four of which are by Lucilius and one by an anonymous writer, a hernia is mentioned. In three (xi, 132, 342, 393) it is spoken of as a troublesome deformity, as in the epigram of Lucilius, who offers to exchange his daughter for a hundred hernias (xi, 393); in the other two its dimensions are so exaggerated that it serves its bearer as a lifebuoy (vi, 166) or as a means of crossing a river (xi, 404).

DWARFS AND GIANTS.

Twenty-six epigrams in the eleventh section (88-95, 99-111, 308, 369, 372, 392, 407) contain caricatures on persons remarkable for their small size or slender form. The terms *μικρός*, *βραχύς*, and *λεπτός* applied to them seem to indicate some form of dwarfism, though of what variety there is no evidence to show. Extant statuettes show that some of the dwarfs living at the time of the early Roman Empire, especially the gladiators employed by Domitian, were undoubted examples of achondroplasia, and it is probable that this type was familiar to Nicarchus and Lucilius, from whom most of these epigrams emanate. Possibly some of the caricatures were inspired by advanced cases of progressive muscular atrophy.

Dwarfs were the pets of wealthy households during the closing years of the Republic and throughout the Roman Empire, and the stories of the pygmies and their wars with the cranes, to which an epigram (xi, 369) alludes, was a favourite subject for caricature, as paintings on the walls of Pompeii still show. Though there are so many epigrams on dwarfs, only two by Lucilius (xi, 87) and Ammianus (xi, 97) respectively refer to giants, possibly from motives of prudence.

NERVOUS DISEASES.

A few allusions are to be found to nervous disorders. Among the most interesting is in a votive epigram by Philippus (vi, 203), the compiler of the second Anthology, commemorating what was probably recovery from hysterical paraplegia after a visit to a holy spring:—

> "The poor old woman lame of foot, learning of the good renown of a healing spring, came one day dragging herself along with an oaken crutch to support her feeble frame. And pity seized the nymphs who on the side of fiery Etna inhabit the watery domain of their father Simaethus. The warm spring of Etna strengthened her feeble legs, and she left her crutch with the nymphs who pleased with the gift consented to send her away without a support."

An epigram by Cometas Scholasticus (ix, 597), one of the latest epigrammatists in the Anthology, expresses a patient's gratitude to the physician whose picture the lines accompanied for recovery from paraplegia.

The following epigram by the Emperor Hadrian (ix, 137) may refer to a case of hemiplegia, or, as Dr. Parkes Weber has suggested to me, to hemiatrophy. A beggar thus addresses Hadrian:—

> "Half of me is dead, and half is tortured by hunger, save, O king, the half tone which still resounds."

To which Hadrian replies:—

> "You offend at once Plutus and Phaethon, the one by still beholding him and the other by keeping away."

The collection of maggots from a rotting sheep's nose as a cure for epilepsy was recommended by an oracle (xiv, 149) to Timocrates the Athenian, and, like many others equally offensive, may have represented a popular remedy for this affection or else was suggested by an artful priest to impress the imagination of the patient. Caelius Aurelianus (Morb. Chron., i, c. 4, par. 139) quotes a long list of cures recommended by Serapion for epilepsy, including camel's hair and bile, crocodile's dung, and the testes of a boar, ram, or cock. As late as the end of the seventeenth century the earthworm was recommended as a cure for "the apoplexy, convulsions, palsie and other diseases of the head and nerves" ("The London Dispensatory," 1696, Lib. ii, cap. 6).

SPECIAL SENSES.

In addition to the satires on the oculists and the mention of a disease of the eyelids which I alluded to in my previous paper, reference is made to sympathetic ophthalmia by Agathias (xi, 352):—

> "The right eye when diseased often gives its suffering to the left."

Epigrams by Philippus (ix, 11), Leonidas (ix, 12), and Plato the younger (ix, 13) describe the partnership of a blind beggar with a lame man.

Three epigrams relating to deafness are all of a broadly comic character (xi, 74, 187, 251). Two are by Nicarchus and describe the mistakes arising from paracusia. The following deserves to be quoted:—

> "Onesimus, in Zeus' name, drive away this deaf old woman, for she is too great a nuisance. If I ask for soft cheese (τυρούς), she brings me fresh wheat (πυρούς). Lately I had a headache and asked for rue (πήγανον) and she brought me a frying-pan (τήγανον). If I ask for wool (ὀπόν) she brings a plank (δοκόν). If I am hungry and want vegetables (λάχανον) she brings me a chamber-pot (λάσανον). If I ask for vinegar (ὄξος) she brings a bow (τοξόν), and for a bow, vinegar. Whatever I say, she never can hear. It is a shame I should become a town crier for the sake of an old woman, and pursue this calling out of doors and at night" (xi, 74).

On the other hand, the advantages of deafness are seen from an epigram by Leonidas (xi, 187):—

> "Simylus the harpist killed all his neighbours by playing at night, except Origenes alone, for Nature had made him deaf. Therefore she gave him life, which is better than hearing."

THERAPEUTICS.

The Anthology contains but few references to the modes of treatment in use beyond those already mentioned, such as the eye salves alluded to in my first paper, baths and clysters, reference to mint in connexion with Nikias the physician, and to pennyroyal as a stomachic. Mention, however, should be made of two anonymous epigrams on cupping glasses (xiv, 54, and App., 117).

"The cunning art of Paean made me conceal within my brazen lips a living fire, and when I draw dark blood from unhappy men I quench the fire within my belly" (xiv, 54).

"I saw a man fixing brass with fire upon another so closely that it formed one with the blood" (App., 117).

The use of an amulet as a protection against disease is mentioned in the following epigram by Lucilius (xi, 257) :—

"Diophantus saw the doctor Hermogenes in a dream and never woke again although he wore an amulet."

VETERINARY MEDICINE.

Deaths of domestic pets inspired several poems in classical antiquity, among the best known pieces of this kind being those of Catullus (C., iii) on the death of Lesbia's sparrow and that of Ovid (Amor., ii, vi) on the death of Corinna's parrot. In the sepulchral section of the Anthology twenty-eight consecutive epigrams (vii, 189-216) by various writers from 300 B.C. to 500 A.D. commemorate the deaths not only of domestic animals such as horses, dogs and birds, but even of grasshoppers and locusts. Three (vii, 214-16) by Archias (119 B.C.), Anyte (300 B.C.) and Antipater (second century B.C.) respectively relate to the stranding of a dolphin. In only two is the cause of death mentioned, a case of a hare which had died from being overfed by its mistress (vii, 207, Meleager) and of a mouse which died from eating gold filings (ix, 310). Eight epigrams in the ninth section deal with veterinary obstetrics. In three (149, 150, 255) human interest predominates, as they recount the history of a man who hanged himself because his cow had died in parturition and a wolf had killed his lamb, but the remaining five (22, 268, 303, 311, 430) relate to animals exclusively and show that with them as with the human race Leto or Artemis presides over parturition.

The following epigram by Philippus (ix, 311) on cicatricial stenosis of the vagina in a bitch obstructing parturition deserves to be quoted :—

"A bitch which rivalled swift stags in its course was wounded in the birth passage when pregnant and all the part as it cicatrised closed up in time, and the hour for delivery arrived. While it was howling terribly a man cut it with a knife and the dear little pups leapt forth from the womb. There is now no need for Artemis to help in delivery since Ares acts as midwife."

Two epigrams by Julius Polyænus (50 B.C.) and Tiberius Illustris (250 A.D.) respectively relate how a recently delivered stag was bitten by a viper in its udder and died with the fawn it was suckling (ix, 1, 2), and an anonymous epigram (ix, 123) describes a blind goat's sudden recovery of vision by pricking its eye with a thorn (? cataract).

If time had allowed I could have added many more quotations, but I am afraid that I have already abused your patience. Allow me to make the following remarks by way of conclusion : Although many of the medical epigrams are anonymous or by writers whose date is uncertain, the Greek Anthology merits more attention than it has hitherto received from the medical historian for the following reasons :—

(1) It offers numerous illustrations of the relations between Greek medicine and religion, particularly as regards Asklepius.

(2) It contains definite references to certain diseases such as gout, alcoholism, and malaria, as well as numerous allusions to epidemic diseases, the nature of which cannot be determined.

(3) It supplies valuable negative evidence of the existence of syphilis in antiquity in spite of the numerous facilities for the spread of the disease.

(4) It illustrates many subjects in the private life of the ancients more or less closely connected with medicine, such as baths, latrines, cosmetics, prostitution, popular remedies, and superstitions.

(5) As a source of medical satire and caricature it deserves to rank with the works of the Latin poets.

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Mr. C. J. S. Thompson showed objects of medical and surgical interest from the Historical Medical Museum of Mr. Henry Wellcome. Amongst the exhibits was a "chastity belt," an early bullet extractor which seemed to be older than the time of Ambroise Paré, and a beautiful ivory model of the temporal bone showing the structure of the internal ear.

Section of the History of Medicine.

December 17, 1913.

Sir FRANCIS H. CHAMPNEYS, Bt., President of the Society, in the Chair.

Health Temples in Ancient Greece and the Work carried on in them.

By RICHARD CATON, M.D.

THE subject on which I have the honour of speaking to you this afternoon is of such wide range that in the time allotted I can only deal with it in bare outline. While knowledge as to the health gods, the shrines of healing and the practice of medicine generally in Ancient Greece has grown rapidly during late years, still there is much that is vague and uncertain as regards origin and the detail of methods. Egypt seems to have preceded Greece in medical lore and also in the superstition which accompanied it. How far Greece learned from Egypt it is hard to say, but there can be little doubt that many Egyptian methods were transported into Greece. The reference in the fourth book of the Odyssey to the superiority of Egypt in medicine is one proof of this; the adoption by the Greeks of the strange custom of incubation long practised in Egypt is another.

In the dim twilight of Greek history Apollo was in some vague and distant way a healer. But by degrees minor deities who specialized more definitely in medicine took his place: they mostly were deified men, and of some of them I wish now to speak to you.

(I) THE CULT OF AMYNOS.

The first I refer to—viz., Amynos—has been for centuries utterly forgotten, and indeed there is no reference to him in Greek literature until a later date, and then curiously enough only in the writings of the Christian Father Eusebius. This ancient cult was only re-discovered a few years ago. *Amynos* was an Athenian god of healing. His name doubtless comes from the Greek word *ἀμυνείν*, to protect, guard, defend, help. He was the helper and protector of the sick. When Professor Dörpfeld excavated the region of Athens between the Areopagus and the Pnyx he laid bare a part of the city forgotten and grass-grown for many centuries, containing streets, houses and shrines, and among them the Amyneion or precinct of Amynos. Here I show you a ground plan of the region portraying small houses, narrow streets, water pipes and sewers. The Amyneion is an irregular area bounded by a wall with a foundation of hard blue limestone, having a temple or chapel at its eastern side. In this plan of the precinct you see an altar or base of an image in the centre of the temple, also a sacred well. Many inscriptions were found. Fig. 1 is an attempt at a restoration of precinct and grove and of the ancient temple. The date is best judged by the pottery, Attic black figured and Proto-Corinthian of 700 B.C. are found, and lowest of all Greek geometrical pottery of 900 or 1000 B.C. were excavated. The temple at that date would have a stone foundation with walls of sun-dried brick covered with cement. The colonade and

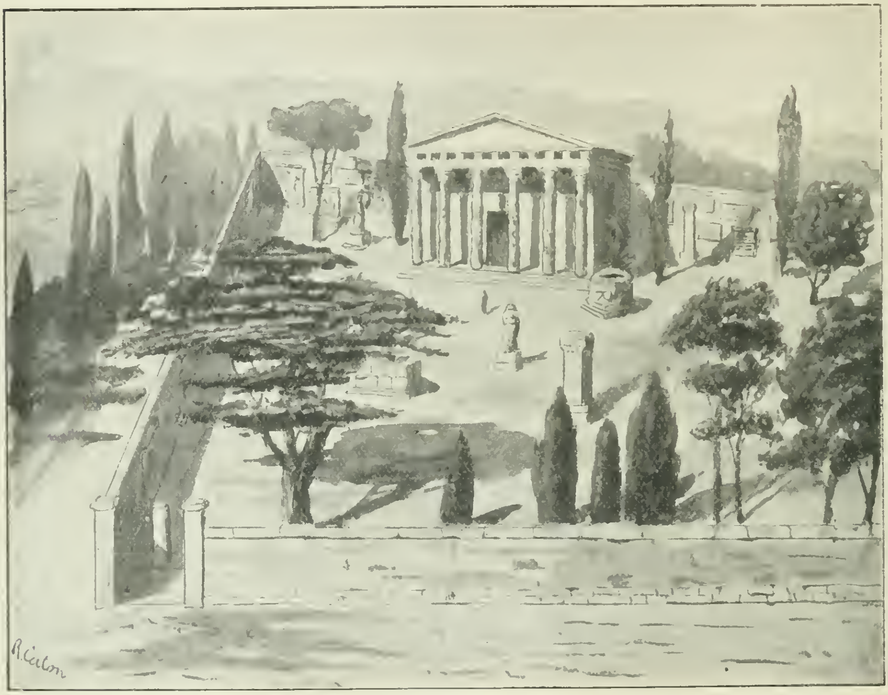

FIG. 1.
Restoration of precinct of Amynos, Athens.

pediment, if existing, must have been of wood, the columns formed of rough pine trunks. No stone drums of columns nor any parts of a stone frieze have been found. There were many inscriptions, these being of later date. The cult of Asklepios came to Athens about 420 B.C. Inscriptions are mostly to *Amynos* and Asklepios, and sometimes to them and Dexion (Sophocles). Fragments of marble snakes are found and numbers of remains of sculptured figures and ex votos. Asklepios seems to have been quite secondary to Amynos in the shrine, and up to Roman times Amynos holds his pre-eminence. Was incubation practised here? We have no information. A second foundation has been found which possibly was the wall of a shed for incubation. Nor is anything known about baths, drugs, or methods of treatment. But treatment seems to have been greatly valued, if we may judge from the inscriptions and ex votos.

(II) THE CULT OF AMPHIARAOS.

Secondly, I wish to speak of the precinct of Amphiaraos near Oropus in Attica. This was the chief sanctuary of the god, though others existed, as at Rhamnus, Argos and Sparta. In a pleasing glen, well clothed with pines, planes and oleanders, through which a stream flows and in which many nightingales lift their voices, the shrine was built. Amphiaraos, a son of Melampus or Apollo, was a prehistoric warrior and a hero, one of the Seven against Thebes and one of the Argonauts. When flying from his enemies the earth opened near Oropus and swallowed up Amphiaraos and his chariot. Why he should have become a great healing god it is hard to say. On the north-west of the stream on a flat strip of ground stand the remains of the sanctuary. In fig. 2 to the west are the ruins of the Temple of Amphiaraos, a building 95 ft. long and 43 ft. wide, having a broad columned portico at the east end, six columns between antae. The cella had three aisles, separated by rows of columns. At the south-west end was apparently a small porch, 8 ft. by 5 ft. A large square base stood near the centre of the cella, on which no doubt stood the great image of Amphiaraos—part of a colossal arm found was doubtless part of the figure—it was rather nearer the eastern end than the west. Probably the temple was not hypaethral, for if so rain would fall on the god; louvres more probably lighted the cella. In front of the temple stood a large altar, 28 ft. long and 14 ft. broad, built of limestone. It was dedicated to several gods. Three long curved steps are seen on the north of the altar, on which no doubt worshippers stood or sat. The sacred spring rises a few feet south of the altar and was used for special purposes only (not for washing hands nor for purification). Amphiaraos rose as a god from this spring—hence its sanctity. North of the temple and altar stood a large number of pedestals bearing statues. North-east of the temple is a large stoa 360 ft. long and about 36 ft. wide. It has an open Doric colonnade of forty-nine columns on the south-east side, the other three sides having solid walls. At each end is a chamber about 24 ft. wide, and between them a long space of 310 ft. A central line of seventeen Ionic columns divided the stoa into two aisles. A marble bench ran along the back wall. The inner face of the wall was stuccoed and painted. Traces of painting still remain. This was the abaton, enkoimeterion, or ward; the women occupied the western end and the men the eastern. The walls cutting off the two small chambers at the ends of the abaton are perforated by small grated apertures. Were these rooms (like the nurses' room in a modern hospital ward) for the attendants, and the grating a means to enable them to keep watch over the sick? Behind the colonnade, excavated from the hillside, is the theatre with circular chorus space about 40 ft. wide. The stage was about 40 ft. by 20 ft. North-east of the abaton, or ward, is a series of bath-rooms, ten in number, dating from the third century B.C., but

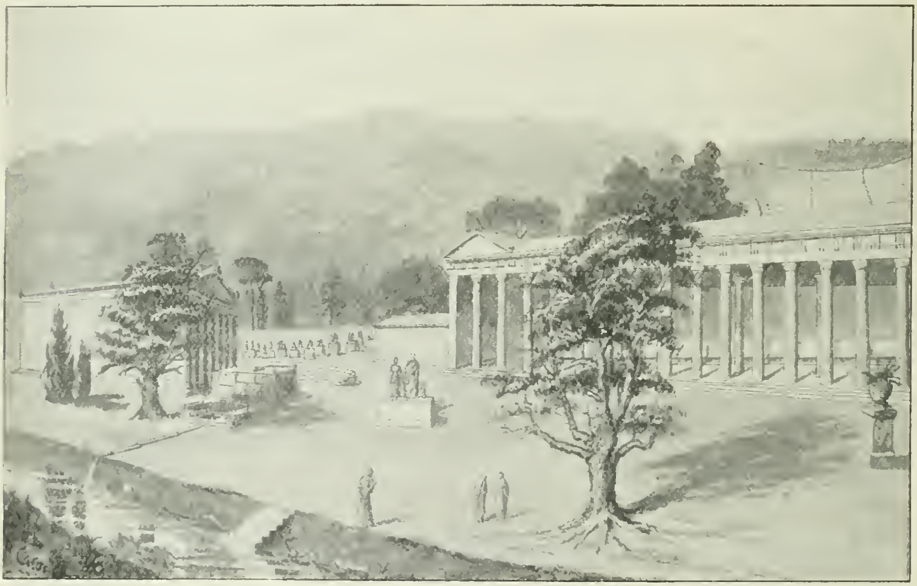

FIG. 2.

Restoration of part of precinct of Amphiaraos, near Oropos.

Roman alterations are evident. Two rooms have a hypocaust. Men and women had separate rooms.

The inscriptions indicate that the sanctuary was founded at the end of the fifth century B.C., and that it was closed during winter. The priest was obliged to be present not less than ten days in each month and never to be absent more than three days at a time. The nakaros, or sacristan, was to attend regularly to his own duties. Any patient misbehaving might be fined 5 dr. On admission each patient paid a fee of not less than 9 obols. The priest, when present, must pray over the victims and put their flesh on the altar. The shoulder of every animal sacrificed, and in some cases both shoulders, was given to the priest, also the skin was ultimately his property. The patients might eat most of the flesh of the sacrificed animal, but no part of it might be taken beyond the precinct. The nakaros wrote down all the names and addresses of the sick. Before incubation each patient sacrificed a ram, and he used its skin as a bed, lying upon it in the abaton. Then incubation commenced, and he nightly awaited dreams and visions of the god. Whether or not any drugs were given no one knows. A special diet with occasional abstinence was enjoined—fasting from all food for one day and from wine for two. No beans were allowed. When recovery took place the convalescent dropped gold or silver coin into the sacred well (which offering presumably was subsequently abstracted by the priest). Models in gold or silver of the diseased organ, or limb, were suspended in the temple near the figure of the god. Many gold and silver vessels and ornaments were given. A festival of the god was held every fourth year. That is all that is known.

(III) THE CULT OF TROPHONIOS.

The shrine of Trophonios at Lebadea, near Thebes, had a lesser vogue for cure of the sick. Methods were somewhat the same—incubation and sleeping on the skin of a black ram.

(IV) THE CULT OF ASKLEPIOS.

Asklepios.—It is difficult to date the rise of the cult of Asklepios; probably it was later than that of Amynos; but it dates back to Homeric times. Tricca was probably its source, but Epidaurus the great centre where it chiefly flourished, and from whence it spread to all parts of Greece, Magna Graecia and Rome. The site of the Hieron was six miles inland from the town of Epidaurus. At the time of its greatness an extensive precinct occupied the beautiful valley extending from the hill Titthion, where Asklepios was suckled by a goat, to Kynortion, on which stood the temple of the Maleatean Apollo.

Fig. 3 is a rough bird's-eye view of the precinct as seen from the north : a splendid array of temple, stoa, theatre, stadium and grove. The gateway with well for ceremonial purification and the northern boundary wall are too far north to be seen in the view. A represents the central temple of Asklepios, built in the fourth century B.C. The eastern façade presented a richly decorated and coloured scheme. The eastern pediment represents a combat of Greeks and Amazons, the western a conflict with Centaurs, a Victory on the apex, and Nereids as acroteria. An elaborate ivory door. This side view of the Temple shows the works of art adjacent to it, and behind a part of the abaton. Fig. 4 shows the interior, the splendid gold and ivory figure of the god with a golden serpent and a temple dog. Chryselephantine sculpture is very beautiful; the ivory, however, tended to crack, as was found at Athens and Olympia. But this great figure of Asklepios never required to be moistened with oil or water as did the others, for the god of physic, we may presume, knew how to preserve his own integument. Only the floor of this temple and fragments of its decorations remain.

B in fig. 3 is the abaton, or enkoimeterion, or hospital ward, half of it probably for men and half for women. On the south it has an open colonnade. So whatever other therapeutic agencies were employed, there is no doubt that pure fresh air was enjoyed by the sick who occupied it. At the west end it was two storeys in height. Here incubation took place, the sick awaited the personal aid of the god or of the serpents, or they hoped for dreams or visions guiding them as to the best treatment for their several ailments. Fig. 5 shows the interior of the abaton.

C in fig. 3 is the tholos or thymele, an extraordinarily beautiful building of white marble, coloured in parts. It was the most splendid circular building ever erected by the Greeks, dating from the third century B.C., built by Polykleitos the younger. It was Doric externally, Corinthian within. Within were two celebrated paintings, Methe (drunkenness) and Eros, suggesting the relation of Dionysos and Aphrodite to the ailments which afflict mankind. There are various opinions about the function of the tholos. Some think it was the sacred well. The foundations are curious, a dark labyrinthine basement, which I think cannot have been a water tank, because (1) it was not cemented and would never have held water ; (2) there is no spring nor conduit leading to it ; (3) the word thymele means a sacrificing place ; (4)

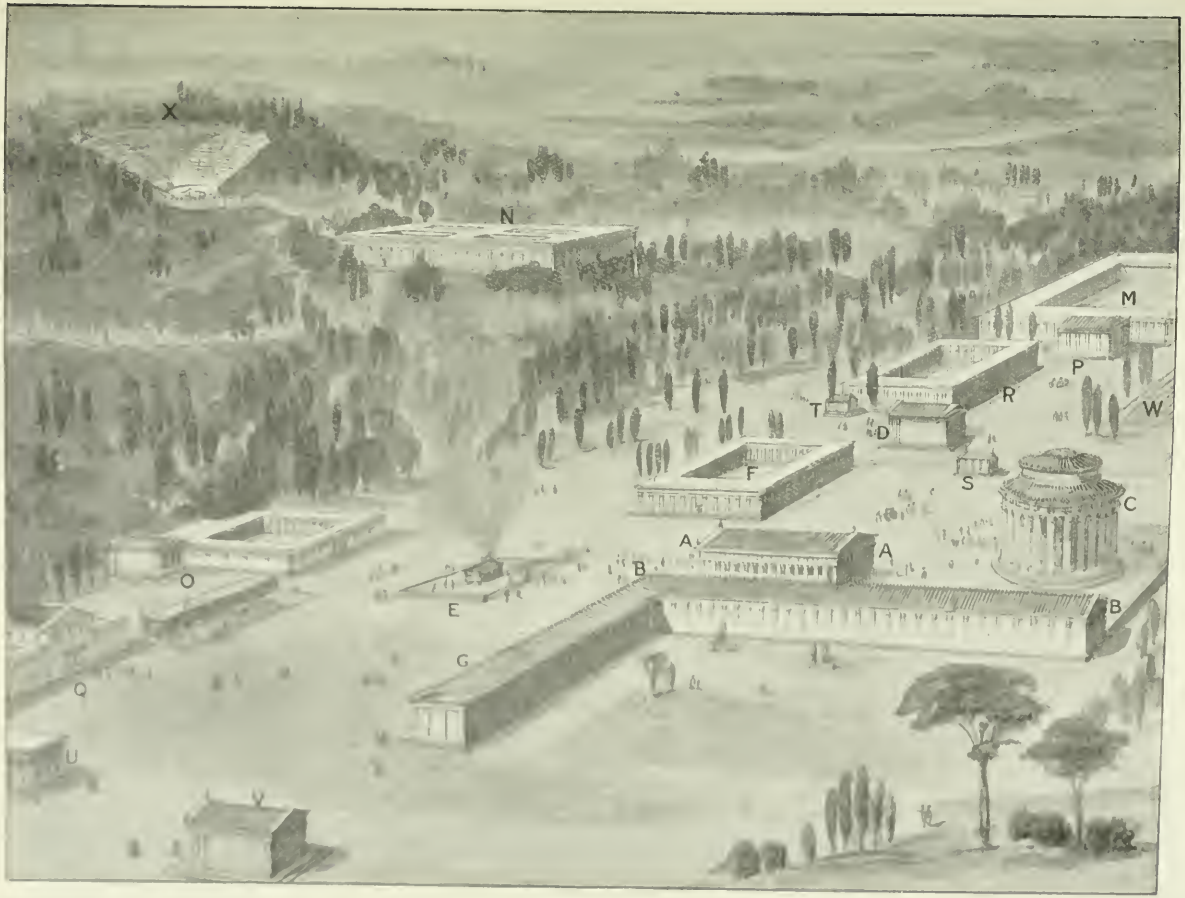

FIG. 3.

Restoration of Hieron of Epidaurus, from the north.

Pausanias speaks of the tholos and the sacred well as entirely distinct. I have little doubt that it was the home or lair of the sacred serpents; in the vaults beneath they dwelt and bred in numbers, and hence they were sent to the numerous Asklepieia all over the ancient world. The snakes would ascend to the floor of the tholos, where bloodless sacrifices were offered to them, and where the sick gave them the honey cakes, popana, and other sacrificial delicacies they were fond of.

D in fig. 3 is the temple of Artemis Hekate. She was a divinity of healing and succour, especially for the young. E in front of the Temple of Asklepios is a large altar for sacrifices to the god. F in this picture represents the square building which has excited much discussion. Within are the base of an altar, much ash, and the remains of vast quantities of the bones of sacrificed animals, much broken earthenware and some fragments of bronze. It dates from the fifth or sixth century B.C., and contained many statues and inscriptions. Probably it may have been the scene of the sacrificial banquets, and perhaps it was a prytaneion in which was maintained the perpetual fire. G is a large building of various dates; it contains baths and perhaps the sacred spring. The library dedicated to Apollo and Asklepios also has been thought to have been housed in the northern part of it. M is a rectangular building which may have been one of the two gymnasia, or perhaps it was an additional abaton. N is a huge rectangular building 90 yards square, with four quadrangles and a large number of rooms—probably a hostel. O is a Roman building, perhaps a temple of I-em-hotep to some Egyptian health god. P is thought to have been the temple of Hygeia, and Q, of later date, is a series of Roman baths. R is a quadrangular building, of unknown purpose, probably the colonnade of Kotys mentioned by Pausanias, possibly a house for priests; it was rebuilt in Roman times. S is probably the temple of the Epidotai, or bountiful gods. The small temple here marked T is thought by Cavvadias to be that of Themis. U is a colonnade extending westward at right angles to the Roman bath. An open aqueduct with basins runs in front of it. Behind this colonnade is a large quandrangular stoa; its exact purpose is uncertain. V is the temple of Aphrodite, as an inscription found there shows; a beautiful statue of the goddess in Parian marble was found near it. W is part of the stadium, which is 600 ft. long. Fifteen or more rows of marble seats border it on the north and south slopes. On the side of the hill Kynortion is seen the theatre, which was built in the fourth or fifth century B.C., by Polykleitos. Pausanias tells us it is the most interesting of the Greek

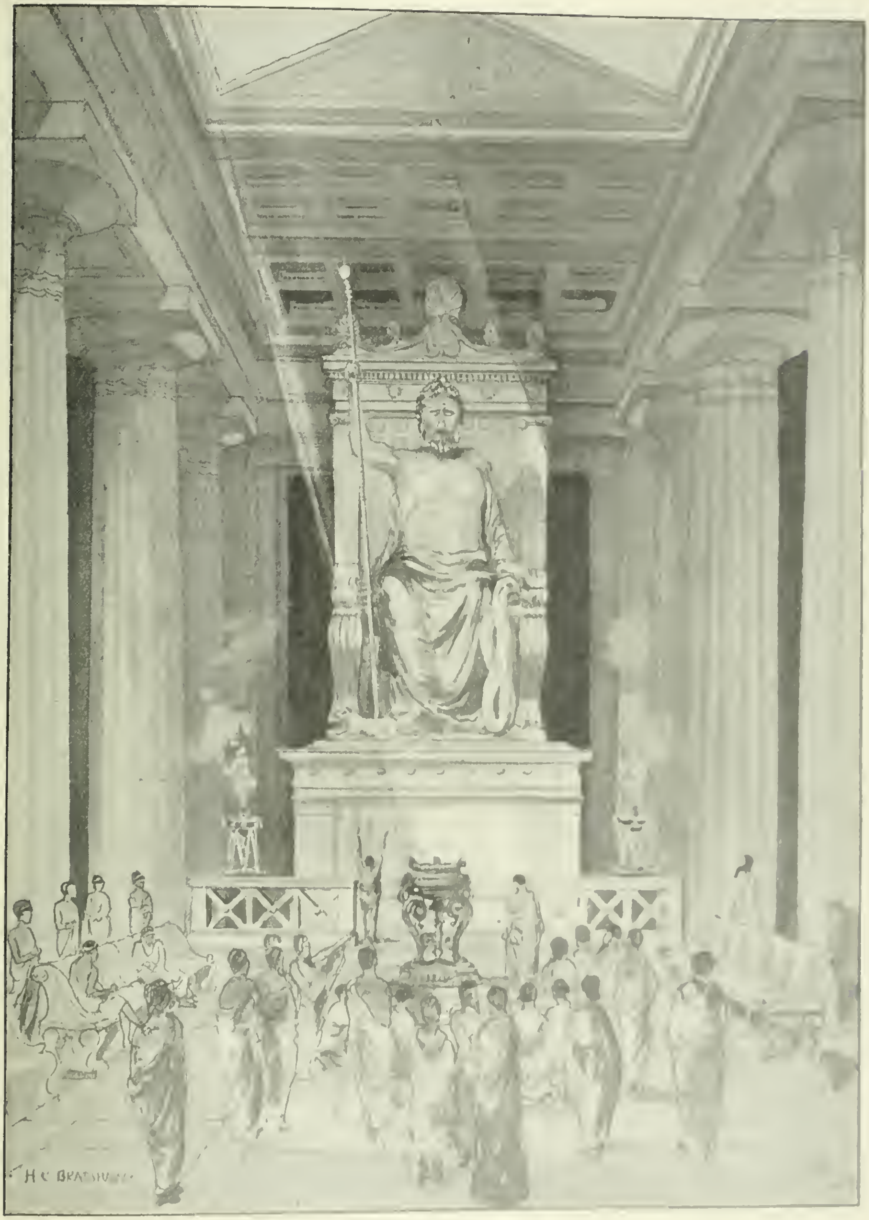

FIG. 4.

Interior of Temple of Asklepios at Epidauros.

theatres of his time. It certainly is one of the most beautiful of those existing to-day: it is marked X in fig. 3.

The koilon or auditorium consisted of fifty-five rows of marble seats, capable of seating, it is said, 12,000 spectators. The chorus space is circular. The stage was 11 or 12 ft. above the chorus space. The acoustics of this theatre are perfect. A loudish whisper on the stage is heard in every part of the auditorium. How many thousands of people have here listened to the plays of Æschylus, Sophocles, or Aristophanes. Vast numbers of the sick came here from all parts of the Greek world and beyond it. They lodged doubtless in the great hostel and in tents: those who were undergoing incubation of course slept in the abaton. At times, as for example at the Festival of the Megale Asklepieia, thousands of visitors came who merely wanted a holiday, just as they came to the Isthmian or the Olympic games. The patient on arrival underwent ceremonial purification, then paid his fees, and arranged with one of the Hieromnemones about his accommodation. He would walk in solemn procession to the temple with singing of sacred pæans, with music of lyre and double flute and burning of incense. He would enter the tholos and, if I am correct in my theory, offer bloodless sacrifices to the snakes, feeding them with honey cakes, &c. He bathed in the sacred fountain, performed certain rites, offered his sacrifices. Priests and physicians probably arranged his diet and treatment. At night he enters the abaton, bringing his bed clothing, and reposes on one of the couches. At nightfall the Nakaros lights the lamps. The priest enters and recites the evening prayers to the god. Here is one that has come down to us in the writings of Ælius Aristidis, a priest of Asklepios:—

> "O ye children of Apollo, who for many in past time have stilled the waves of sorrow and shown a light of safety for those who travel, be pleased to receive our prayer which ye inspire in sleep and vision. Order it rightly, we pray you, according to your loving kindness. Preserve from sickness, give the body such measure of health and strength as may enable it to obey the spirit within: that our days may be passed in vigour and in peace."

Fig. 6 represents the scene in the abaton.

Silence was then enjoined, the lights put out, and the priest commanded all to fall asleep and hope for guiding visions from the god. The serpents would probably visit the sick; their visits were most welcome. These serpents were of course tame and harmless. The phrase in the inscription "*ἰάσατο τῇ γλώσσα*" refers to their habit of licking an injured part.

The inscriptions speak of the god often appearing to the sick, of

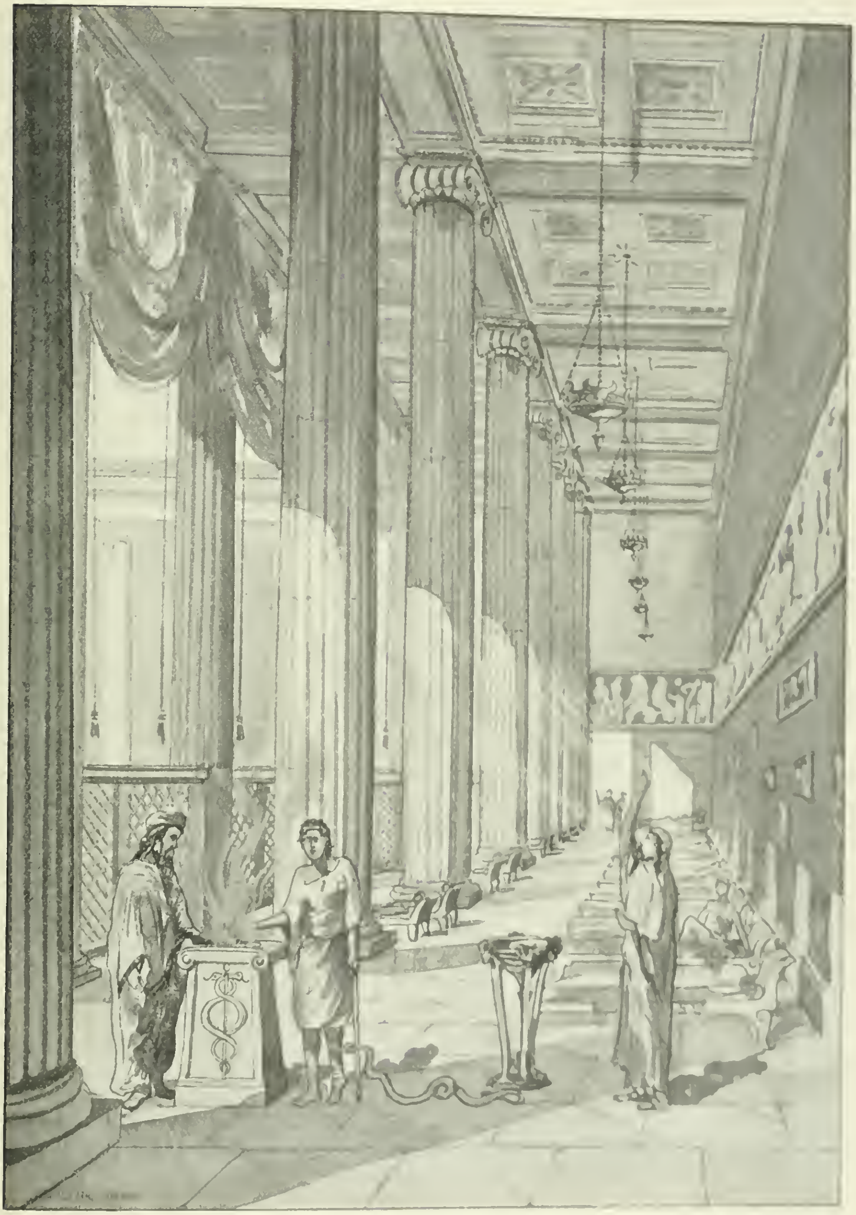

FIG. 5.

Interior of abaton at Epidaurus.

miraculous cures and of visions. Here follow examples: Hermodikos was paralysed. In his sleep the god told him to go out on to the hillside and bring in the largest stone he could find. He brought it in and it now lies before the abaton. The stone, it is believed, lies there to-day, but no man is strong enough to lift it. A man suffered from a malignant sore on the foot. While sleeping a serpent licked the foot with its tongue; the sore was at once healed. Hermon of Thosos was blind. His sight was restored by Asklepios; but Hermon did not send the fees he had promised on his return home, so the god again made him blind. He came back to the Hieron with the fees and was again cured. A man had an abscess in the abdomen. In a dream the god ordered his servants to hold him while he (Asklepios) opened the abdomen, cleared out the abscess, and sewed up the wound; when the patient awoke a great pool of blood was on the floor of the abaton and he was cured. A great number of such inscriptions were fixed on the wall of the abaton.

THE PRACTICAL UTILITY OF THE HEALTH TEMPLES.

In later times superstition had a less share, and science a greater one in the work of healing. We read of the priests using reasonable and useful methods of treatment. Diet of a plain and simple kind, hot and cold baths, poultices, various medicaments, such as hemlock juice, oxide of iron, hellebore, squills, lime-water, and drugs to allay pain, active gymnastic exercise, friction of the skin, and counter-irritation. Bleeding was practised, as shown in this vase-painting, and surgical methods were in use, for reliefs of surgical instruments exist. Doubtless many of the sick benefited greatly, but some incurable cases came for help, and here a difficulty arose. Neither birth nor death was permitted by the Greek religion to occur in the precinct of a god. If any sick man failed to improve and was seen by priests and attendants to be obviously dying, instead of being tenderly nursed and soothed, he was removed from his couch, conveyed to the nearest gate, expelled, and allowed to die on the hillside, unhelped and untended. Asklepios had rejected him, and no minister of the god might defile himself by any dealing with death. Sometimes also, a poor woman anticipating maternity (who was being treated for some ordinary ailment) was suddenly and mercilessly expelled at the moment when she needed help and comfort most. This cruel law prevailed at all times, but in the days of the Antonines, a home for the dying, and also a sort of maternity hospital, were erected outside the precinct. Apart from this cruel

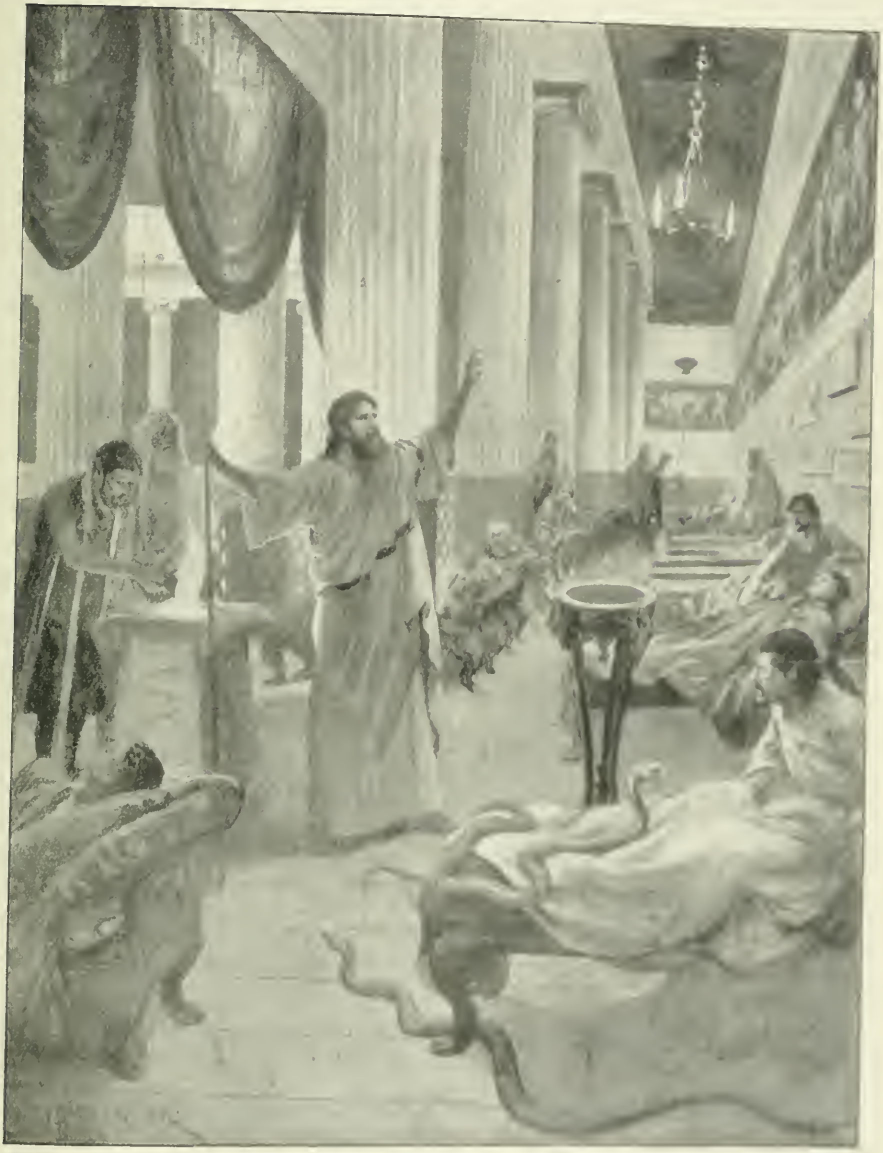

FIG. 6.

Dr. Caton's reconstruction of the scene in the abaton or open-air sleeping place at nightfall. (By kind permission of the *Illustrated London News*.)

superstition, the sick seem to have been treated with kindliness and humanity, and they in general were benefited. The whole atmosphere of the place was helpful. The beauty of the landscape, the supreme art displayed in the buildings, the sculpture and the paintings on every hand, the charm of the sacred grove, of the cultivated flowers and of the music, the solemn services in the temples, the plays in the great theatre, the exercises of the palæstra and the stadium were constant sources of interest. Numerous semicircular seats or exædræ were provided, in which the invalid could rest, the more cultured occupying themselves in the study of books from the library. The innumerable votive offerings and commemorative tablets, recording cures, must have excited a beneficial faith and hope.

The priests were men of culture and refinement, anxious to help and comfort. I show you a portrait of Asklepios, portraying sympathy and sorrow for the suffering. I think that, notwithstanding the superstition that prevailed, we can read in this face sympathy with suffering and an earnest desire to help. For those especially who had been initiated at Eleusis, and for whom advanced age or incurable sickness gave little prospect of life, the calm dignified forms of Demeter, Persephone and Iakchos, would suggest patience and the hope of a pure spiritual after-life, free from all bodily infirmity; for the Greek and Roman heart, as Ruskin tells us, was full of the hope of immortality.

The pure air of the mountains by night and day, the plain, simple diet, the rest and change, and the medical treatment, the beauty and charm of the place, made Epidaurus intensely popular among the Greeks, and the Christian teachers in the early centuries of our era found it more difficult to displace Asklepios than any other of the gods of Greece or Rome from the beliefs of their converts.

It is quite evident from the writings of Ælius Aristides, who himself was priest of Asklepios, that many of the members of the medical profession in towns and cities discarded the supernatural side of the work of the Asklepieia—indeed, I doubt if Hippokrates himself had any faith in it. His writings show little evidence of such belief. Of course, in the towns there were physicians practising on a purely secular basis, some of them supported by a local rate named the *ἰατρικόν*. Some of these physicians had been trained at the Asklepieia, others had a secular training as pupils with private practitioners. How far the public trusted in Amynos, Amphiaraos or Asklepios, rather than in the personal skill of the doctor, it is difficult to say; until the wide extension of the Christian faith in the third and fourth centuries, the former certainly held an important place.

Section of the History of Medicine.

January 28, 1914.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

On Roman Medicine and Roman Medical Inscriptions found in Britain.

By Henry Barnes, M.D.

It would obviously be quite impossible in the limited time at my disposal to give anything like a comprehensive account of the conditions or methods of medical practice among the Romans in ancient times. During the last five and twenty years there has been a revival of interest in medical history, and much has been written that is deserving of close study. I would particularly refer to the Fitzpatrick Lectures delivered by Professor Sir T. Clifford Allbutt before the Royal College of Physicians in 1909 and 1910 on Greek Medicine in Rome; to the papers by Dr. Cordell published in the *Bulletin of Johns Hopkins Hospital* on the medicine and doctors of Horace and Juvenal[1]; to a lecture by Dr. Sambon delivered before the British and American Archæological Society of Rome, in which an interesting account is given of donaria or votive offerings which have been found not only in Italy, but wherever the Roman supremacy had reached; and, lastly, to the paper read by Dr. Capparoni before the Medical History Section of the International Medical Congress last August, "On Sepulchral Inscribed Stones of Christian Doctors found in the Catacombs of Rome." From these and similar contributions to current medical literature the student may obtain a fairly comprehensive idea of the position of the medical profession and the state of medical science in Rome in its early days. It is not my intention to go fully into these matters to-day, but a brief reference to them is necessary in order to appreciate the full value of the inscriptions of medical interest which the Romans have left in Britain

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[1] *Bull. Johns Hopkins Hosp.*, Balt., 1901, xii, pp. 233-40; 1904, xv, pp. [illegible]-7.

It is generally considered that the history of medicine starts with the earlier period of Greek civilization. The worship of Asklepios as the God of Healing was widely spread among the Greeks and lasted even to Christian times. Temples were erected in his honour at various places, the principal one being at Epidaurus, but minor ones were erected at Athens, Cos, Pergamos, and other places. Crowds of sick persons flocked to these shrines in order to be healed, just as in modern times relief is sought by a pilgrimage to the waters of some sacred spring. From Greece the worship of the God of Health spread to Rome, where the god became known as Aesculapius. The first temple erected was on the Island of S. Bartolommeo in the River Tiber. It dates from the time when a great plague prevailed in the city from B.C. 293 to 291. The legend records that the Senate consulted the Sibylline books, by which they were directed, as the only remedy to bring Aesculapius of Epidaurus to Rome. An embassy was therefore sent and was well received. The sacred serpent followed the ambassadors into their ship, where it remained until the trireme entered the Tiber, when it escaped and, swimming across the river landed upon the island, where a temple was soon erected to Aesculapius. From Lumsden's "Antiquities of Rome," published in 1912, I have had photographed a copy of four votive inscriptions taken from a marble tablet found in the ruins. The inscriptions are, of course, in Greek. The first refers to one Caius, who was blind and recovered his sight by worshipping first at one side of the altar, then at the other; the people standing by and rejoicing that such miracles were performed under our Emperor Antoninus. The second refers to Lucius, who had a pleurisy and was despaired of by every man. By taking ashes from the altar and mixing them with wine and applying them to his side, he was cured. In the third the god admonished Julianus, who vomited blood, despaired of by every man, to come and take pine berries from the altar and eat them with honey for three days, and he was cured. Obviously the god was well acquainted with the hæmostatic virtues of turpentine. In the fourth the god admonished Valerius Aper, a blind soldier, to come and take blood of a white cock, to beat it with honey and collyrium, and apply it to his eyes for three days, and he recovered. The last three publicly returned thanks to the god.

Apart from the worship of Aesculapius the Romans do not appear to have originated or possessed an independent school of medicine. It is true they had from very early times a very complicated system of superstitious medicine or religion related to the cure of diseases, borrowed most probably from the Etruscans. In the earlier days of the Republic the master of the house appears to have undertaken the care of the health of the household. In "De Re Rustica" of the elder Cato we have a graphic account of the conditions of family medical practice in the third century before Christ. Two of the longest chapters are devoted to the virtues of the cabbage as a remedy. He summarizes its virtues in a single sentence: "*Ad omnes res salubre est.*" It was his great panacea for all kinds of ailments. Whether it be dullness of hearing, dimness of sight, polypus of the nose, cancer, ulcers or tumours, according to Cato, *the* remedy is cabbage. If a bone be dislocated, he orders a cabbage poultice to be applied and *cito sanum fict.* If this remedy fails the aid of magic must be sought. You are directed to take a green twig 4 or 5 in. long, and this, cleft through the middle, becomes the conjuring rod, and the following incantation is to be used while the patient is held by the hip by two men (duo homines teneant ad coxendices):—

IN ALIO S.F. MOTAS VAETA DARIES DARDARIES
ASTATARIES DISSUNAPITER.

The very rhythm of these magic words suggest manipulative movements which would doubtless be used with the incantation, and the latter half of the last word is suggestive of the sound which the head of a dislocated bone makes when it slips into the socket. Two other incantations are given, to be used if the first fails. Both are suggestive of more violent manipulations, and to my mind sound more like imprecations than incantations.

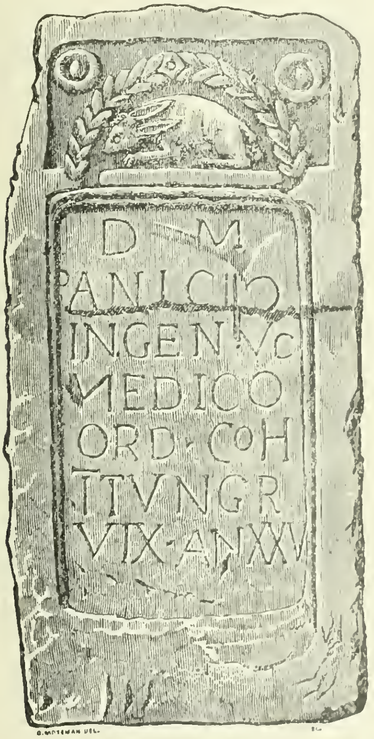
(1) HUAT HANAT HUAT ISTA PISTA SISTA
DOMIABO DAMNAUSTRA.

(2) HUAT HAUT HAUT ISTA SIS TAR SIS
ARDANNABON DUNNUSTRA.

Cato had no theories about disease except such as spring from mere superstition. He hated and despised the Greeks. In his opinion, if Greek medicine once got itself established in Rome the end would not be far off, for that wicked race had sworn to exterminate the Romans by its medicine. In spite, however, of his vigorous protest, Greek physicians flocked to Rome. The first whose name is preserved as having migrated thither was Archagathus, who came over from the Peloponnesus in B.C. 219, and many others followed his example. Archagathus was a citizen of Sparta, and he succeeded so well in overcoming the prejudice against his order that the Senate conferred upon him the privilege of a Roman citizen. A firmer footing for Greek medicine was gained by Asclepiades, who was born in Bithynia in B.C. 124. He went to Rome as a young man, and soon distinguished himself by his medical skill and by his oratory. The charm of his manner, the dislike of strong remedies, and his faith in the therapeutic virtues of wine (which, under the stern regime of the Republic, women were forbidden to drink), made him very popular. He believed more in hygiene than in physic, and it was largely owing to his influence that the Romans became such devotees of the hot bath, massage, and the *cura cutis.* Of his pupils the most famous was Themison, who gave permanence to the teachings of his master by framing a new system of medical doctrine which lasted for centuries. He maintained that it was useless to consider the causes of disease; it was sufficient to know what was common to all diseases. Treatment was directed not to any special organ, but to correcting the morbid condition; relaxing the body if it was constricted; causing constriction if it was too lax; and in the mixed state acting according to the predominant condition. This simple rule of treatment was the system or "method" from which the school took its name. Among other well-known Roman physicians about this period were Craterus, who, according to Horace, was the great authority on heart disease; Cleanthes, who stitched up the wound which the younger Cato made in his abdomen by falling on his sword; Antistius, physician to Julius Cæsar, who examined the Dictator's body after death, and found that of the many wounds only one was mortal; Alexion, whose death was deplored by Cicero as an irreparable loss; and Cleophantus, named by the same writer as *Medicus suavis.*

Under the Empire a new order of medical practitioners came into existence. Augustus was a great invalid and in the hands of the doctors nearly all his life. His household swarmed with practitioners of the healing art. There were *medici servi* who were slaves; there were *superpositi medicorum,* or overseers of the slaves; there were *unguentarii;* there were the *medici ocularii* and the *medici ophthalmici* and the *medici auricularii*—specialists for eye diseases and ear diseases; there were the female healers (*medicæ*) who devoted themselves mainly to diseases of women, and midwives (*obstetricæ* and *sagæ*), a bad lot who traded on the vanity, credulity, and corruption of women.

The army and navy had their own doctors, and several inscriptions mention *medici* attached to camps, army corps, and legions. There was, as these inscriptions show, not only a *medicus cohortis* but a *medicus legionis*. There is now in the Newcastle Museum a sepulchral slab with an inscription which shows that it was erected to Anicius Ingenuus, the *medicus ordinarius* of the first cohort of the Tungrians. The monument was found at Borcovicus, one of the most magnificent Roman stations in Britain, and the elaborate carving on it shows that this young doctor of the cohort—he only lived twenty-five years—was held in high esteem by his comrades (fig. 1).



D M
ANICIO
INGENVO
MEDICO
ORD . COH
I TVNGR
VIX . ANXXV

Diis Manibus
Anicio
Ingenuo
Medico
Ordinario (?) Cohortis
Primae Tungrorum
Vixit annos viginti quinque

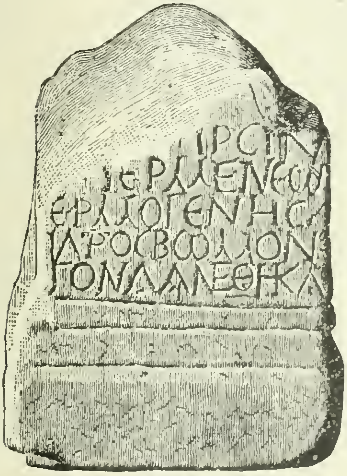
Size, 5 ft. by 2 ft. 6 in.

FIG. 1.

Roman altar found at Borcovicus. Now in Newcastle Museum

Several monumental and votive tablets found in other parts of the world refer to army doctors. In Gruter's "Inscriptiones Romanae" there are three in which physicians of cohorts are mentioned, and in the "Syntagma Inscriptionum" of Reinesius there is a description of a tablet erected by Titus Claudius Julianus, clinical physician to the fourth Prætorian cohort, to himself, to his wife, Tullia Epigone, and to their freedmen and freedwomen. In the Chester Museum there is the lower portion of an altar which was found in that city in 1851. It has a Greek inscription on it in which the Greek equivalent of *medicus* (*Iatros*) is used. Through the courtesy of the Chester Archæological Society I am able to show you an illustration (fig. 2). It does not appear to whom the altar was dedicated, but it shows that Hermogenes, a physician, dedicated it. This Hermogenes has been identified as the imperial physician in the service of Hadrian. Among the physicians of the early days of the Empire, Antonius Musa held a foremost place. He cured the Emperor Augustus of some liver complaint and was loaded with honours. Tiberius, who ascended the throne on the death of Augustus, appointed Charicles as his physician, but being a man of robust constitution he told the doctor he might keep his physic for fools. Celsus, who lived during this reign, has left us a treatise, "De Medicina," which has been much valued from those early times to the present day. Scribonius Largus, when in attendance on the Emperor Claudius during his short campaign in Britain (A.D. 43), according to Sprengel composed a treatise "De Compositione Medicamentorum." Sir Thomas Browne confirms this statement. Thessalos, who lived in the time of Nero, called himself Iatronices, or conqueror of doctors. It was about this period that the Emperor's physician came to be known under the title of "Archiater," and this distinction was held by Andromachus, physician to Nero, and by Demetrius and Magnus under Antoninus Pius and Marcus Aurelius. Many of these doctors accumulated enormous fortunes. Pliny tells us that Stertinius earned by his town practice about 600,000 sesterces a year, equal to about £5,000 of our money, and it is on record that Cami, a surgeon, obtained £2,000 for one operation. Professor Haverfield tells me of an inscription found at Assisi in which a freedman, by race a Greek, describes himself as *Medicus Clinicus Chirurgus Ocularius*, a title which suggests that he knew how to advertise, but he made good use of his money by spending 30,000 sesterces for statuary in a temple of Hercules, and a still larger sum for the repair of the streets of his town. Such a profitable profession naturally attracted many to its ranks, and it soon became overstocked. This led to a subdivision and specialists became common. In the latter half of the first century of the Christian era there were physicians who did not practise surgery and surgeons who limited themselves to one kind of operation.

It is not uncommon to read of a certain distrust of doctors in these ancient times, and this was certainly justified. Many doctors allowed themselves to be made the instruments of private vengeance. Glicon poisoned the wound of Pansa, Nero sent doctors to his rich aunt Domitia to hasten her end, and Agrippina, who had employed Lucusta, a woman well skilled in poisons, to murder her husband Claudius, and finding that the poisoned dish of mushrooms was not having the desired effect, sent for the physician Xenophon, who, under the pretext of attempting to ease the vomiting, put a quill dipped in poison down the Emperor's throat, and this proved rapidly fatal. Medical men were often sent to open the veins of prisoners, and we find them as accomplices in the assassination of Drusus and Marcus Aurelius. There are, however, notable examples of men who stood out nobly in the midst of so much corruption and crime; and among these are the two physicians in attendance upon the Emperor Severus during his Scottish campaign. On the return of the Emperor to York the physicians received instructions from the Emperor's son, Caracalla, that they should use means to hasten the death of the Emperor. Their refusal, while in accordance with the best traditions of the profession, was disastrous to them; for one of the first acts of the reign of terror and bloodshed of Caracalla was to order a great massacre of 20,000 of the best men of the State, including his father's physicians. One of these physicians was Serenus Samonicus, who was one of the minor Latin poets who has left us a poem of 1,115 lines in hexameter verse



. . . . . ΗΡΣΙΝ
. . ΕΡΜΕΝΕΣΙΝ
ΕΡΜΟΓΕΝΗΣ
ΙΑΤΡΟΣΒΩΜΟΝ
ΤΟΝΔ'ΑΝΕΘΗΚΑ

"To (. . . . .) the saving
and most mighty, I
Hermogenes a physician
dedicated this altar."

Fig. 2.

Roman altar with Greek inscription, found at Chester in 1851.

full of information extracted from the best authorities on natural history and the healing art, mixed up with a good many foolish and puerile superstitions. Some years ago I devoted considerable study to this work, and contributed a paper on it to the St. Louis Medical History Club, afterwards published in the *St. Louis Medical Review*. If time had permitted I should have liked to refer more fully to this paper, but I must content myself with a brief reference to one word which was first used by Serenus—viz., Abracadabra. This is a cabalistic word which was to be used as a charm, and was stated to be a sovereign cure for a deadly form of fever. The charm had to be worn round the neck for nine days, and then to be thrown over the shoulder into an eastward running stream; and it is interesting, as showing how the use of the remedy has continued, to record that after defining the meaning of the word, such a recent publication as the Century Dictionary quotes the following from a MS. in the British Museum:—

> "Mr. Banester saith that he healed 200 in one year of an ague by hanging Abracadabra round their necks, and would staunch blood or heal the toothache, although the partys were 10 miles off."

There is a class of sculptured and inscribed stones of medical interest found in Britain of which I am able to show you several illustrations. These consist of dedications to Aesculapius. The first is a Roman stone with a Greek inscription found at Maryport, Cumberland. It records that it was erected by Aulus Egnatius, pastor, and dedicated to Asklepios. Greek inscriptions are rare in Britain. One was found by Horsley at Lanchester, who, on purchasing it and getting it out, found that it had a Latin inscription on the other side. The altar had been broken, only the lower part being left, but, on comparing the two sides, it is conjectured that it has been a dedication of Titus Flavius Titianus, the tribune to Aesculapius. In 1879 a votive tablet was discovered at Binchester, containing two sculptured figures, one being Aesculapius and the other Salus. Unfortunately a portion of Salus with part of the inscription has been broken away, thus causing some uncertainty as to the name of the dedicator. The generally accepted translation of the expanded inscription is as follows: "To Aesculapius and Salus for the health and safety of the ala of Vettonians Roman citizens Marcus Aurelius Habrocomas physician has erected this." In the British Museum there is an elaborately carved Roman altar found at Chester in 1779. On the front is an inscription which shows that it was a dedication to Aesculapius and his daughter Salus. On the right was sculptured the Cornucopia and rudder of fortune, and beneath them a patera and prefericulum, a festoon surrounding them all, and on the left hand beneath a similar festoon is a serpent twining round the staff of Aesculapius, and probably what is meant for a simpulum, a culter, &c. In the Carlisle Museum we have a Roman altar shaped monument, 43 in. high, found at Netherby, which has on its left side a jug and a snake, and on the right side a patera and knife. Professor Haverfield considers that this may have been a dedication to Aesculapius. The inscription is almost illegible, but from the last three lines it is inferred that the stone commemorates the restoration of a

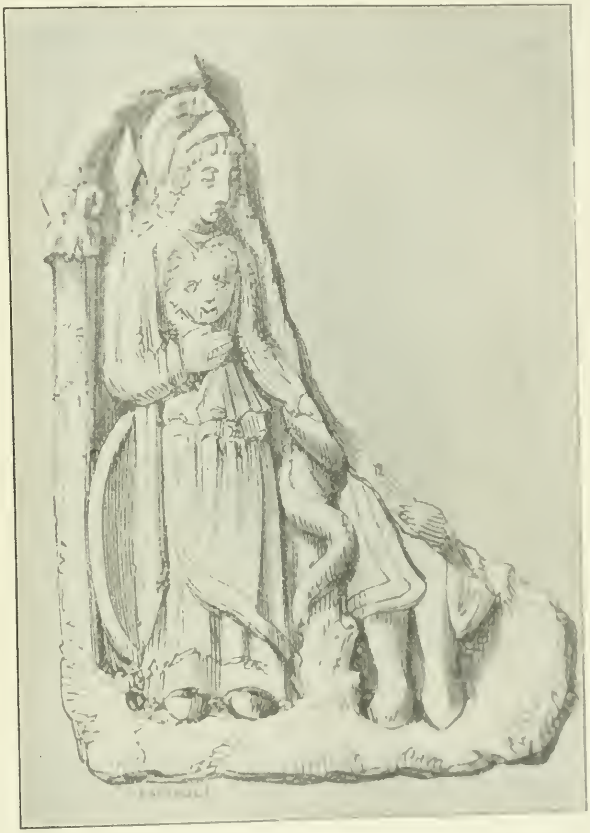
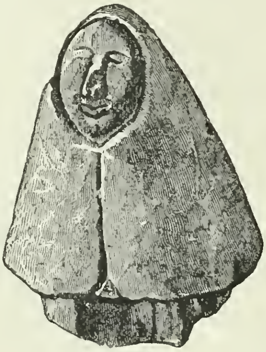


FIG. 3.

Roman sculptured stone found at Procolitia.

ruined building according to a vow by a man called Maximus. There is now preserved at Chester a stone which was found at Procolitia, on which is carved a figure of Minerva and an attendant (fig. 3). The upper part of the right-hand figure has been lost, but it has probably been intended for Aesculapius, as a portion of a staff and serpent twining round it are seen; and he is usually represented in this way. About ten years ago a fragment of a stone, apparently dedicated to Aesculapius, was found in Greenwich Park, and is now in the British Museum; and in 1907, during the restoration of Tunstall Church, near Kirkby Lonsdale, a Roman altar was found with an inscription, which Professor Haverfield has deciphered. The inscription shows that it was a dedication to Asklepios and Hygieia, the only example I have met with in which the Goddess of Health appears in Britain under her Greek name. In 1852, during some excavations at Birdoswald, Cumberland, a small sculptured Roman god was discovered (fig. 4). The figure, which is of stone, represents a convalescent patient wrapped in a cloak, and has been identified by antiquaries as the god Telesphorus, an attendant of Aesculapius. According to Banier, Telesphorus is always drawn like a young man, and with a singular habit. It is a long robe that covers the whole body, insomuch that the arms are not seen; he has upon his head a kind of cowl, so that nothing but his face is uncovered. Two small figures wrapped in hoods and mantles resembling the little god Telesphorus were found some years ago in the Castle Yard, Carlisle (fig. 5).



Size, 7 in. by 5 in.

FIG. 4.

Figure of Telesphorus, found at Birdoswald.

The discovery of these ancient monuments may be taken as evidence that the worship of Asklepios or Aesculapius was not unknown in these distant outposts of the Roman Empire. I have already referred to the temple of Aesculapius, erected on the island of San Bartolommeo at Rome. Many donaria or votive offerings have been found in the sands and river near the island, and some of you will probably remember a collection made by Dr. Sambon of donaria found in various parts of Italy, and exhibited in London some years ago. Most of these are now in the Historical Medical Museum in Wigmore Street. The offerings consisted of precious metals, which were melted into ingots and used by the priests according to special regulations. Cups of valuable metal with votive inscriptions were occasionally found, but these were far outnumbered by poorer offerings, mostly of terra cotta. Among the latter were representations of various parts of the human body, some with evident traces of disease marked upon them. One of these was an Etruscan terra-cotta cast of a case of goitre found at Capua, probably a donarium to some deity for recovery from goitre. Invalid medicine cups of various shapes were also found. I show an illustration of one in the shape of a duck from the Sambon collection. I also show a photograph of an infant's feeding bottle found at Carlisle, and now in the Carlisle Museum (fig. 6). It is ingeniously fashioned in the shape of the female breast, but has unfortunately been broken.

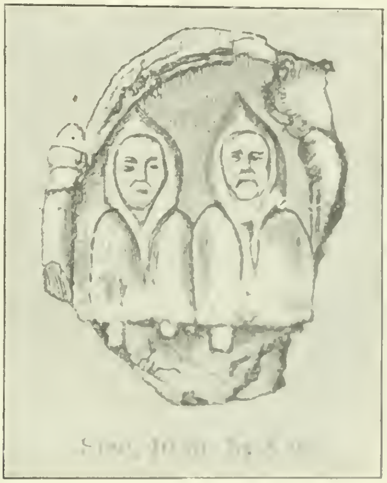


FIG. 5.

Two figures resembling Telesphorus, found at Carlisle Castle.

The shrines of the God of Healing were usually situated at the source of some hot spring or mineral water, and patients used to come far and near to bathe and drink the water. There were no doctors at the spring, but the priests regulated the use of the waters and prescribed for each patient. Then, before leaving, the patient had to throw his offering into the water. In connexion with this part of my subject, some reference should, I think, be made to the Rudge Cup, as many learned antiquaries consider that it has been an offering of this description, and if the places named on the rim were all Roman stations in Cumberland, it is very probable that it may have been an offering to the presiding deity of the sulphur spa at Gilsland. Dr. Bruce, the historian of the Roman Wall, says, "there is not a spring in the whole mural region so likely to attract the attention of the Romans as this spa," and the discovery of the figures of the Roman god Telesphorus a short distance from the spa would support the view that the worship of Aesculapius was duly recognized here. The cup is a brass cup about 4 in. in diameter and 3 in. deep. The outside of it has been wrought, and it is richly enamelled with red, blue, and green. It was discovered in 1725, and is now the property of the Duke of Northumberland, who has kindly placed at my disposal a recent photograph of it, which I now exhibit. It will be noticed that there is an inscription on the rim, and as this is not readily legible in the photograph now before you, I have had a photograph taken of the engraving of the cup which appears in the Lapidarium Septentrionale. The precise reading of the inscription may be taken as follows:—

A MAIS ABALLAVA UXELODUM CAMBOGLANS BANNA.

Much discussion has taken place as to the interpretation of this inscription, and the most probable theory is that they were the stations of an itinerary. In one of the museums at Rome there are three silver vessels, each engraved with the names of places between Cadiz and Rome. They were found in the ancient baths at Vicarello, along with votive vases, medals, and other relics. This shows that it was customary to inscribe the stations of an itinerary on votive cups. In identifying the places on the Rudge Cup, it must be confessed that attempts have hitherto not been very successful, and the following is put forward as suggestive and without any pretence to finality. In a treatise on geographical science, compiled in the city of Ravenna in the seventh century, we find several names similar to those on the cup described as "civitates in Brittania." These are Maia, Avallaria, Uxeludiano, Banna. It has been suggested by Horsley in his "Britannia Romana" that all the names on the Cup are in the ablative, and are governed by the preposition *a*, and that the *e* before Ambloglans was intended for an *o*, and should be joined to Uxelodum, which would make it Uxelodumo. The first name on the cup is Maia, and Horsley considers this was Moresby, an important Roman station near Whitehaven. There is a general agreement that Aballava was Papcastle, near Cockermouth; Uxelodunum, or Axelodunum, was Ellenborough, near Maryport; and Amboglans, or Amboglanna, was Birdoswald—all important Roman stations in Cumberland. In Dr. Bruce's opinion Banna was Gilsland, and if we accept this view, we have an itinerary which would represent the journey of a patient from Moresby to Papcastle, and then by way of Maryport and Birdoswald to Gilsland, where the offering to the presiding deity of the healing waters would be made.

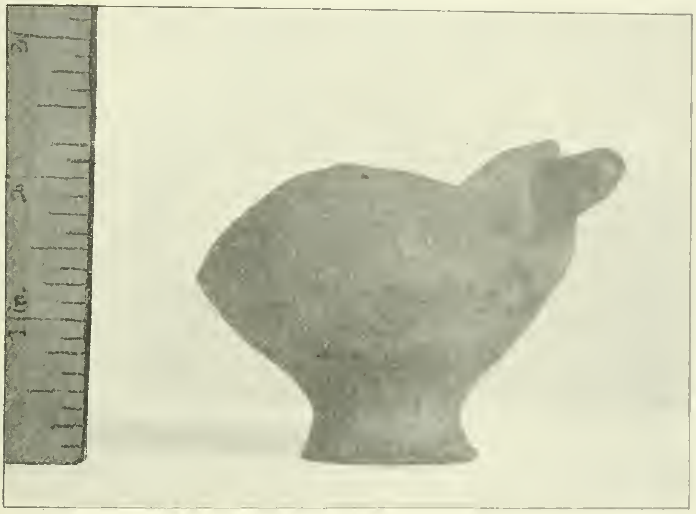


FIG. 6.

Tettina, feeding bottle, Roman, found in Carlisle.

There is another class of inscribed stones relating to the Roman medical profession and their practice in Britain which were for a long time a puzzle to antiquaries, and which therefore deserve a more detailed description and explanation. These are the stamps used for impressing the name of the makers and the purposes of certain medicinal preparations. Numerous examples have been found in Germany, France, and Italy, and Hübner, in his work "Inscriptiones Britanniæ Latinæ," published in 1873, gives a list of fifteen of these stamps which have been found in Britain, and which are described under the title of *Sigillaria medicorum ocalariorum.* They are usually made of greenish schist or steatite, and consist of small thin square blocks, generally with an inscription on each of the four edges. In a few instances the stone is of an oblong form, and has only two inscribed sides. In one instance found at Wroxeter in 1808 the stamp was of circular form. The localities in which these stamps have been found are as follows: Kenchester, Bath, London, St. Albans, Cirencester, Colchester, Lydney (Gloucestershire), Littleborough (Nottinghamshire), Tranent (East Lothian), and Golden Bridge, Tipperary. The inscriptions are in small capital letters, cut intagliate (like the letters on modern seals), and consequently reading on the stone itself from right to left, but making an impression, when stamped upon wax or other plastic material, which reads from left to right. The inscriptions generally contain first the name of the medical practitioner to whom the stone pertained; then the name of some special medicine or medical formula; and, lastly, the disease or diseases for which the medicine was prescribed. It is rather remarkable that in all the examples hitherto described the diseases mentioned on the stamp are uniformly those of the eyes; and hence they are supposed to have been used only by those physicians who treated eye diseases. It is probable that the ingredients of the various preparations were hardened with gum or some viscid substance, and kept in a solid state, as being more convenient for carrying from place to place, and as always ready to be liquefied by fluids when required for use; the stamps being impressed just before the medicines attained the last stage of solidification.

In the management of the diseases of the eye the Roman practitioners used both local and constitutional treatment, and in the practical part of their treatises referring to ophthalmic affections there are collyria enumerated for almost every stage of every disease of the eye. Galen has left us formulæ for upwards of two hundred of these ancient collyria, and numerous formulæ for the same class of preparations are to be found in the writings of Aetius, Myrepsus, Scribonius Largus, Celsus, Paulus Aegineta, and others. The collyria became known sometimes under the names of the oculists who employed them. A more numerous class received their name from some characteristic of the mixture. Thus we have the collyrium *chloron*, named from its green colour; the *cirrhon*, from its yellow tint, and the *evodes*, from its pleasant smell. Occasionally an ingredient entering into its composition seems to have given the name by which the collyrium became known. Thus we have the *crocodes*, made of crocus or saffron; the *nardinum*, made of spikenard; the *diasmyrnes*, containing myrrh; and the *diarrhodon*, containing roses. In one instance the name was given on account of the fame it had acquired by curing some great person, and Galen gives the recipe for the collyrium which Phlorus used in the case of Antonia, the mother of Drusus. Several examples of the collyria I have mentioned are recorded in the medicine stamps found in Britain. Professor Simpson, of Edinburgh, published in 1851 a series of elaborate papers on these stamps, and I have had photographs taken of the illustrations in his paper, which I now show.[1] The first photograph represents the Tranent stone, which is now in the Scottish National Museum of Antiquities; one side refers to the sweet-smelling (*evodes*) collyrium of Lucius Vallatinus for cicatrices and granulations; on the other side is shown the Apalalo-crocodes of the same oculist for affections of the eye. The word "diathesis" was often used by Roman physicians as synonymous with disease, and not as we use it as designating a predisposition to some special disease. The word "*crocodes*" signifies that it was made of crocus, which Dioscorides describes as of especial efficacy in fluxions of the eyes, and the qualifying epithet "*apalo*," derived from the Greek, signifies soft or mild. The next two stamps are in the British Museum. Stamp No. II refers to the three collyria of Sextus Julius Sedatus. One of them is of especial interest, as it refers to the *crocodes* of Paccius. Galen, in his chapter on ulcers of the eye, especially mentions the *crocodes* of Paccius, and recommends its use. Stamp No. III is small and broken, does not contain the name of the oculist, but refers to a collyrium for dimness of vision. Stamp No. V is the Bath stamp, which was found in 1831. It had four inscriptions, but only one is shown, which is translated as the leaden melinum or golden yellow collyrium, for clearness of vision. Stamp No. VI was first described in the *Gentleman's Magazine* for 1778. The name of the oculist is Marcus Julius Satyrus, and he has four collyria, one a copper (*dialepidos*) collyrium for granulations (aspritudines), the second a myrrh (*diasmyrnes*) collyrium for the commencement of ophthalmia (lippitudo), the third was an incense (*dialibanum*) collyrium for suppurative discharges of the eyes, and the fourth a mild *penicillum* to be used with an egg. Stamp No. VII has three inscriptions, and seems to have belonged to two oculists, Lucius Julius Juvenis and Flavius Sekundus. The collyrium at the bottom is of myrrh, to be used twice a day at the commencement of the attack. The one on the right is for clearing the sight, and the left one for white cicatrices of the cornea (albugines). Stamp No. VIII represents the stamp found at Littleborough. It has inscriptions on its two ends and one on one of its oblong sides. The latter obviously refers to the name of the proprietor of the stamp, but the lettering is so irregular as to render deciphering hazardous. The collyria at the two ends are diapsoricum and stactum. Stamp No. IX is the rounded stamp found at Wroxeter. The inscription is much contracted, but if expanded it may be taken to read as: "The incense of Julius Bassus for every eye disease, to be mixed with an egg." Stamp No. X was found at Kenchester, in Herefordshire, and was first described in 1849. It has inscriptions on each of its four sides, showing that it was the stamp of Vindacius Ariovistus; only two are shown. The upper one refers to the infallible (*anicetum*); the second one is partly defaced and illegible. The two not shown referred to the *nardinum* or spikenard collyrium and the *chloron* or green collyrium. Stamp No. XI is the Cirencester stamp, found in 1818. It has inscriptions on two of its sides, one showing that it was the frankincense collyrium of Minervalis for attacks of ophthalmia, to be used with an egg, and the other the yellow collyrium of Minervalis for every pain of the eye. Stamp No. XII was found in Ireland. It is engraved on one side only, showing that it was the *diamysus* of M. Juventius Tutianus for old cicatrices. The collyrium *diamysus* derived its name from containing as its principal ingredient the *misy*, a metallic vitriolic preparation used as a stimulant and escharotic by the ancients. It is mentioned by Galen, Oribasius and Paulus Aegineta. Pliny, in describing the properties of *misy*, says that "extenuat scabrities oculorum." Paulus Aegineta says it has a wonderful efficacy in diseases of the eyes. It is believed to have been a combination of sulphate of copper and sulphate of iron. Of the other mineral ingredients named in these stamps, it will suffice to say that *dialepidos* were scales of copper, *cerussa* was carbonate of lead, and *psoricum* was, according to Galen, a mixture of litharge and chalcitis (a pure sulphate of copper which had contracted efflorescence from age). The remedies belonging to the vegetable kingdom named in the stamps include myrrh (diasmyres), saffron, frankincense (dialibanum), spikenard, and opobalsam or balm of Gilead.

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[1] Since writing this paper I have seen a good collection of oculists' medicine stamps in the Historical Medical Museum in Wigmore Street.

With the exception of a few oculists' stamps discovered since Sir James Simpson's papers were published, I have now placed before you all the inscriptions of medical interest which the Romans have left us in Britain which have come under my notice, and I should like to conclude this paper by a short extract from the writing of a distinguished antiquary and historian, published more than 300 years ago, as it shows the care and foresight which the Romans exercised towards their sick and wounded. In his account of the Picts wall, the great barrier erected by the Romans between the German Ocean and the Solway Firth, Camden says:—

> "The fabulous tales of the common people concerning this wall I doe wittingly and willingly overpass, yet this one thing which I was informed of by men of good credite I will not conceal from the reader. There continueth a settled persuasion among a great part of the people there about and the same received by tradition; that the Roman soldiers of the Marches did plant everywhere in old time for their use certain medicinable herbs for to cure wounds: whence it is that some empericke practictioners of chirugery in Scotland flock thither every year in the beginning of summer to gather such simples and wound herbs, the virtue whereof they highly commend as found by long experience, and to be of singular efficacy."

Truly, the Romans were a wonderful people, and the relics of their occupation of Britain are worthy of close study.

Dr. F. PARKES WEBER said one must not consider every figure of a little boy dressed in a cloak with a pointed hood over his head as representing Telesphorus, the God of Convalescence. This dress was still much used; it was, in fact, a very natural clothing for a herd-boy of any kind who had to spend most of the day in the open air exposed to all kinds of weather. It was hardly likely that all the little terra-cotta figures of the "Telesphorus Type" in the British Museum and elsewhere were really meant to represent Telesphorus. It was much more natural to regard them as genre representations of little boys dressed as herd-boys—a familiar sight doubtless to ancient Greeks and one likely to be met with during every walk in the open country. The story about the physician Xenophon murdering his patron, the Emperor Claudius, at the bidding of Agrippina, must surely be accepted with hesitation. This Xenophon was a native of the Island of Cos, and his portrait appeared on certain little bronze coins of Cos, two of which Dr. Weber was able to exhibit at the Seventeenth International Medical Congress in London. Xenophon was a benefactor of his native island by obtaining certain privileges from the imperial government in favour of the inhabitants. He was said to have given the Emperor poison when introducing a feather into his mouth on the pretence of making him vomit. This could scarcely have been proved at the time.

The Medical Education and Qualifications of Oliver Goldsmith.

By Sir ERNEST CLARKE.

THOUGH it would not appear from published records as if your honourable profession set much store upon the associations with it of Oliver Goldsmith, I feel confident that each of you has, in his unprofessional capacity, a feeling of tenderness and pity for him of whom Garrick said that he was "for shortness called Noll, who wrote like an angel, but talked like poor Poll"; and who was described by Dr. Johnson for the monument in Westminster Abbey as "Poeta, Physicus, Historicus, qui nullum fere scribendi genus non tetigit, nullum quod tetigit non ornavit."

As to the relations of Goldsmith with the medical profession, there is singularly little in all the many volumes enshrined in the magnificent library of the Royal Society of Medicine; and we are entitled to assume that more materials do not exist elsewhere. It seemed good, therefore, to your President and Honorary Secretaries, whom I have the privilege of calling my friends, to enlist the co-operation of a layman who happened to have lately come into possession of some new and special information on the subject, in placing before the Section of History the true facts, so far as they are now known, as to Goldsmith's medical education and qualifications.

There appears to be even a doubt in some minds as to whether Oliver had any medical qualifications at all. Macaulay, who wrote in his loftiest manner a condescending article for the "Encyclopædia Britannica," which has been repeated in all subsequent editions of that work, professed himself extremely sceptical on this point. Describing Oliver's return to England in February, 1756, "without a shilling, without a friend, and without a calling," Macaulay alleges that "if his own unsupported evidence may be trusted, he had obtained a doctor's degree on the Continent, but this dignity proved utterly useless to him." Later in the article he sneers, "Notwithstanding the degree which he [Goldsmith] pretended to have received on the Continent, he could procure no patients."

This attack I regard as wholly unfounded and monstrously unfair; but it has passed for gospel, and may perhaps have been the basis for the remark made by a learned professor of our own time, who, addressing the students at one of our London Medical Schools at the opening of the session last October, gave as three examples of medical men connected with poetry: John Keats, L.S.A.; Robert Bridges, M.A., M.B.Oxon. (our present Poet Laureate), and Oliver Goldsmith, M.B. The last named, said he, "after ineffectual attempts to qualify in divinity and law, obtained a mysterious medical degree in the University of Padua during the course of his wanderings through Europe"—and so dismissed him after a playful reference to the eccentricities of Oliver's professional garb in London.

Perhaps I had better deal at once with the statement that Oliver got a degree at Padua: there is the absolute evidence to disprove it in the published work, "De natione Anglica et Scota," by Jo. Aloys Andrich (Patavii, 1892). Nor is there any solid ground for supposing that he obtained a medical degree from any other foreign university. It is only because he stayed at Leyden for some time after his period of study at Edinburgh that it has been suggested that he obtained a Leyden degree; but in the Album Alphabeticum of that university his name does not appear.

With regard to Louvain, it is certainly true that a literary hanger-on of Goldsmith named Glover, "who, after having been educated for the medical profession, usually received the title of Doctor,"[1] wrote, in 1774, a short biography of his patron (published anonymously), in which it was said that Goldsmith "made the tour of a considerable part of Flanders, took the degree of Bachelor of Physic at Louvain, and thence went through Switzerland to Geneva." But there is no confirmation of this, and what Goldsmith says himself in his own article on universities—to be presently referred to—seems to negative the suggestion. Sir James Prior, the most laborious of Goldsmith's biographers, said in 1837 that "the records of Louvain being lost, the statement cannot be disproved, but from a comparison of circumstances it is improbable" (i, p. 178). We must therefore look nearer home for such a degree; and, when I have told my story, you will, I trust, entertain very little doubt on the subject.

There are some reflections in the chapter (xi) "On Universities" in Goldsmith's "Inquiry into the Present State of Polite Learning in Europe" (published anonymously on April 2, 1759), which are somewhat significant:—

> "We grow learned, not wise, by too long continuance at college. This points the time in which we should leave the university. Perhaps the age of twenty-one, when at our universities the first degree is taken, is the proper period."

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[1] *See* Sir James Prior's "Life of Goldsmith," 1837, ii, p. 181

He divides the universities of Europe into three classes, and gives, as examples of the first or obscurantist class, Prague, Louvain, and Padua; of the second, Edinburgh, Leyden, Göttingen, and Geneva; of the third, Oxford, Cambridge, and Dublin.

> "As for the first class, their absurdities are too patent to admit of a parallel. It is disputed which of the two last are more conducive to national improvement. Skill in the professions is acquired more by practice than study: two or three years may be sufficient for learning their rudiments. The universities of Edinburgh, &c., grant a license for practising them when the student thinks proper, which our universities refuse till after a residence of several years . . . Those universities must certainly be most frequented which promise to give in two years the advantages which others will not under twelve . . . The Universities of Edinburgh, &c., must certainly be most proper for the study of those professions in which men choose to turn their learning to profit as soon as possible . . . This slowness in conferring degrees is a remnant of scholastic barbarity. Paris, Louvain,[1] and those universities which still retain their ancient institutions, confer the doctor's degree slower even than we . . . In a word, were I poor, I would send my son to Leyden or Edinburgh, though the annual expense in each, particularly in the first, is very great."

It may be desirable that I should explain before I go further how I come myself to be interested in the question of Oliver Goldsmith's medical qualifications. In connexion with another literary research on a wholly different matter, in which the books and documents once in possession of Bishop Percy of "Reliques" fame came under review, a lady friend of mine who is a descendant of the Bishop recently confided to me for detailed examination a large bundle of papers labelled "Goldsmith" which had been in the family a great many years but had never been critically studied. Amongst the documents in this bundle was a memorandum as to the events of Goldsmith's earlier life which Dr. Percy says he took down from Goldsmith's own lips "one rainy day at Northumberland House" (April 28, 1773), and in which it is said that—

> "After taking the degree of A.B. he proceeded upon the Line of Physic, and took the degree of M.B. when he was about 20, he however ceased to reside after his degree of A.B."

We shall see later how far this statement can be justified from other evidence; but meanwhile it may be noted that in Glover's "Life" of 1774 it is stated (p. 4) that in the year 1749 Goldsmith "obtained a Bachelor's degree, but his brother's merit on leaving the College not being rewarded with any preferment, our author was advised to the study of physic, which he commenced by attending several courses of anatomy in Dublin." Information to the same effect is given on p. 29 of the "Annual Register" for 1774, in a notice of Goldsmith, signed "G" (who was no doubt Glover), and the advice to "turn his thoughts to the study of physic" is there stated to have been given to Oliver by "Dean Goldsmith of Cork." So that it would appear Oliver had at least some vague idea when at Dublin of medicine as a profession.

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[1] Compare George Primrose's interview with the Principal of Louvain in chapter xx of "The Vicar of Wakefield."

Goldsmith was born on November 10, 1728. He was admitted a sizar at Dublin on June 11, 1745, and took the degree of Bachelor of Arts on February 27, 1749. Intermediately, he had run away from college owing to his personal chastisement by his tutor, Theaker Wilder, but had returned to Dublin at the instance of his elder brother Henry, who, according to the original written statement (also among the papers in my temporary custody) made by his sister, Mrs. Catherine Hodson of Lissoy, to Dr. Percy after the poet's death—

> "fitted him out again, and brought him to Dublin, and at least outwardly reconciled him to his tutor. From this [time] the Dr. fell into many little extravagances when he got a remtance from the Country, he lived well but still was called a good Idle scholar, but never pleased his Tutor, who imagined was rather convinced he cd. do much more than he did however he got all the Honnours of the College for his standing. . . . After his Father's death he was taken a perticular notice of by his Uncle Contrine who w^{d} have him persue his studdys and brougt him to himself where he asisted him till he took his degree. He then w^{d} have him read for orders, and wd. have given him Bread, but this he never liked for his inclination led him to travail."

Nevertheless, to please his good uncle, the Rev. Thomas Contarine, Oliver did read for orders, and the sister tells of his waiting on Bishop Synge at Elphin, who asked his age, "which he told was twenty, and his Lordship said he must wait till he was of a proper age." This interview must therefore have taken place very soon after Oliver had taken his B.A. degree (say some time in 1749). Then his uncle got him "a Tuition at a gentlemans Family in the Neighbourhood, where he lived a year, but he never liked confinement." This brings us to, say, the end of 1750. He made after this an excursion to Munster, and "stay'd about six weeks away, but he returned to his Mothers without a penny." The sister's narrative continues:—

> "After this he did not know well what to do with himself, for return to his Tuition he would not. He liv^{d} som time with his Sister Hodson, before he wo^{d} attempt to see his Uncle Contrine, but soon a reconciliation was brought on [by] Mr. and Mrs. Lawder, his Uncle's daughter. . . . His Uncle and Friends then concluded to send him to the Temple, and had his name entered.

They then acquipt him handsomly, and he accordingly set of for Dublin on his way to London, but unfortunately met a Mr. S—— at a Coffie house. They both fell into play and lost every shilling of Fivty Pound, so once more return[d] to his Mother a hart broken dejected being. 'Twas then he began to think of his past misconduct and if he was once more taken notice of to behave with more circumspection in the future. They then desird him he migh prepair for the studdy of Physick, and once more his good Uncle was reconsild to him. At len[th] he was sent to Edinburg and in 1753 enter[d] that College."

Dr. Percy's Memorandum of April 28, 1773, already referred to, says:—

"After his degree of M.B. (about 1751) he removed to Edinburgh at the expenses of his Uncle Contarine, who was like a father to him, where he pursued his medical studies under Munro for about two years and a half, and then removed to Leiden, where he staid about a year studying chemistry under Gaubius and anatomy under Albinus."

The actual period of Oliver's admission to Edinburgh University is given as the autumn of 1752 by Sir James Prior in his painstaking "Life of Goldsmith," so that it would appear that from 1750 to 1752—i.e., from his twenty-second to his twenty-fourth year, he was leading an idle and more or less graceless existence without any definite purpose in view.

When he got to Edinburgh he seems to have tried (or at least tried to induce his benefactor, Uncle Contarine, to believe he tried) to fit himself for the medical profession, and to have had some vague idea of eventually practising in the neighbourhood of his birthplace, for he says in writing to his uncle from Edinburgh on May 8, 1753: "I read (with satisfaction) a science the most pleasing in nature, and I may truly say, the only thing here that gives me pleasure. How I enjoy the pleasing hope of returning with skill, and to find my friends stand in no need of my assistance." (Prior, i, 145-47.)

In this letter he mentions amongst the professors, "first, as most deserving, Mr. Munro, Professor of Anatomy." "Munro is the only great man among them: so that I intend to hear him another winter, and go then to hear Albinus, the great professor at Leyden." Alexander Monro primus (1697-1767) was the first Professor of Anatomy at the University of Edinburgh, and had himself studied at London, Paris and Leyden, as did also his son, Alexander Monro secundus (1733-1817), who entered the University of Edinburgh at the same time as Goldsmith. The class-rolls of Professor Monro have been preserved, and in them the name Oliver Goldsmith appears as entering the class of anatomy at the end of October, 1752, and as paying £3 3s.; also as entering at the end of October, 1753, and as paying another £3 3s. Possibly he obtained certificates of attendance on Monro's lectures and used them in his subsequent career at Leyden and elsewhere. There is no mention of Goldsmith's name in the roll of matriculated students of the University for 1750-54, but at that time matriculation was not compulsory. According to Prior (i. 136), Oliver became a member on January 13, 1753, of the Medical Society of Edinburgh, but there is no other record of his association with that Society.

In a later letter written from Edinburgh to his Uncle Contarine, probably about January, 1754, Goldsmith says:—

> "After having spent two winters in Edinburgh, I now prepare to go to France the 10th of February. I have seen all that this country can exhibit in the medical way . . . . The circle of science which I have run through, before I undertook the study of Physic, is not only useful, but absolutely necessary to the making a skilful physician . . . . I shall spend this spring and summer in Paris and at the beginning of next winter go to Leyden. The great Albinus is still alive there, and 'twill be proper to go, though only to have it said we have studied in so famous an University." (Prior, i, 155-57.)

In a subsequent letter addressed to his uncle from Leyden in the spring of 1754, he tells a story of his arrest at Newcastle on his outward journey from Edinburgh to the Continent, and of his imprisonment for a fortnight on suspicion of being a Scotchman enlisted for the French army: and he adds pleadingly: "Dr. Sr., Keep this all a secret, or at least say it was for debt: for if it were once known at the university, I should hardly get a degree." I refer to this phrase later in my paper. As to his future movements, Goldsmith says in this letter from Leyden: "Physic is by no means taught so well as in Edinburgh . . . . I am not certain how long my stay here will be: however, I expect to have the happiness of seeing you at Kilmore, if I can, next March."

Nothing definite is known as to Goldsmith's subsequent wanderings in France, Switzerland and Italy, beyond the incidental references in his "Animated Nature" to what he himself observed at different places, though he says in a letter to his cousin, Mrs. Jane Lawder, of Kilmore, dated August 15, 1758, that he had written to that address from Leyden, Louvain and Rouen, but received no answer. We have, therefore, only the account to rely upon which Goldsmith himself gave to Dr. Percy on April 28, 1773, as follows:—

> "He then went about 1753 to Padua in Italy, where he staid 6 months, and saw Venice, Florence, Verona and all the north part of Italy. He was obliged to return back thro' France &c. on foot, lodging at Convents chiefly of the Irish Nation. After spending in this Peregrination near a year, he came to settle in London: this was about the breaking out of the War in 1756.

Here he first tried to practice Physic, living in the Bank Side, & then removed to the Temple: where he had plenty of patients, but got no Fees."

The published biography prefixed to the four volumes of Goldsmith's "Miscellaneous Works," issued by the booksellers in 1801, which Dr. Percy no doubt originally helped to compile, but for which, owing to disputes with the publishers, he declined any responsibility, thus refers to Goldsmith's medical studies after Edinburgh and Leyden:—

"He then went to Padua in Italy, where he staid 6 months, and if he ever took any medical degreee, it was probably in this ancient school of medicine" (i, 36).

The following footnote is appended:—

"However, a former biographer says 'He took the degree of Bachelor of Physic at Louvain. (Life of Dr. O. Goldsmith, printed for Swan, 1774, 8vo)'" [see *ante*].

The footnote proceeds:—

"In February 1769, Dr. Goldsmith made an excursion to Oxford with Dr. Johnson, and was admitted in that celebrated university *ad eundem gradum*, which he said was that of M.B."

This phrase, "which he said was that of M.B.," was so non-committal that I looked with some expectancy amongst the Percy papers confided to me for an explanation of it. I found some sheets in Bishop Percy's writing labelled "Memorandums extracted from Pocket Books relating to Dr. Goldsmith and the club at the Turk's Head in Gerrard Street down to Goldsmith's death, Monday 4th April 1774." These Memorandums commence with February 21, 1759, when Percy spent the evening with Dr. Grainger and then met Goldsmith for the first time. Under the year 1769 appear the following notes:—

"Tuesday 14 Feby. I went with Mr. Johnson and Dr. Goldsmith to Oxford."

"W. 15. We all dined in University College."

"Th. 16. We dined with Mr. Morthwaite at Queen's College."

"Fri. 17. We dined with Tom Warton in Trin. Col."

"Sat. 18. We all returned to Town."

"N.B. On this occasion Dr. Goldsmith was admitted as eundem gradum, wch he said was M.B."

Here, therefore, was an actual date to go on. Between February 14 and 18, 1769, Johnson, Goldsmith, and Percy were at Oxford together, and whilst there Goldsmith was granted by that University an ad eundem gradum degree of M.B.

Having reached this stage of my investigation, it was clearly incumbent upon me to try to find out what was the original University that had given Goldsmith a medical degree, on the faith of which Oxford had admitted him in February, 1769, *ad eundem gradum.* In this difficulty I sought the powerful aid of the present Regius Professor of Medicine at Oxford, the President of this Section. Sir William Osler was unable to find in the official Registers of Convocation and Congregation at Oxford (both very carelessly compiled at this period) any trace of a degree for Goldsmith; and to this extent his researches had the same negative result as those made by previous investigators like Sir James Prior.[1] But, not to be daunted, Sir William set what he described to me as "a sleuth-hound" to work in searching the files of the local newspapers, and shortly afterwards he sent to me in triumph the subjoined extract from *Jackson's Oxford Journal*, for Saturday, February 18, 1769, which appears conclusive:—

> "Yesterday Oliver Goldsmith, Esqr., Batchelor of Physick in the University of Dublin, author of *The Traveller a Poem*, of the *Present state of Polite Learning in Europe*, and of several other learned and ingenious Performances, was admitted in Congregation to the same Degree in this University."

Thus we are driven back upon Oliver's *alma mater* for his original degree in medicine. As we have seen, he took the A.B. degree at Dublin on February 27, 1749. According to Robert Bolton's translation of the Dublin Statutes issued in that same year "no one shall be admitted to the degree of Batchelor of Physic who has not first taken the degree of Batchelor of Arts, and who has not completed three years (reckoning from the day of his admission to the degree of Batchelor in Arts)."

The earliest date at which Oliver could have presented himself for the medical degree was therefore January, 1752. These three intermediate years he had muddled away. It was not until 1752 that as the result of a family conclave "they then desird him he migh prepair for the studdy of Physick," to quote again the narrative written down by his sister, Mrs. Hodson, after his death.

It was obviously considered undesirable that he should prosecute his medical studies at Dublin, and consequently he was sent to Edinburgh in the autumn of 1752. He remained there till February, 1754, when he went abroad, professedly to study medicine further at foreign universities. In the letter (already quoted) to his benefactor, Uncle Contarine, sent from Leyden in the spring of 1754, he wound up by saying as to his escapade at Newcastle, "Dr. Sr., Keep this all a secret, or at least say it was for debt: for if it were once known at the university, I should hardly get a degree."

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[1] *See* a letter written to Prior on February 21, 1834, by Dr. Bliss, then Registrar of the University of Oxford, quoted in Prior's "Life," 1837, ii, pp. 201, 202.

Must he not be thinking of the University of *Dublin*, where he had not enjoyed the best of characters when he was an undergraduate, and of the possibility that the further degree of M.B., which he, a B.A. of over three years' standing, was hoping eventually to obtain, might be imperilled if news reached the University authorities of his having been in prison at Newcastle?

In Dr. Percy Kirkpatrick's interesting "History of the Medical Teaching in Trinity College, Dublin," issued in 1912, he expresses a doubt as to how far the Regulæ for the medical degree were observed in early days, or what evidence of study was required from candidates for it. May it not have been the case that after Goldsmith had returned to London from abroad, and had obtained in 1758, through his friend Dr. Milner, a nomination as doctor to one of the factories on the Coast of Coromandel, he approached his old University to award him the degree of M.B. (query, in absentiâ) in view of his medical studies at Edinburgh, Leyden and elsewhere. Such things were possible at that date, though not usual.

The Coromandel scheme seems to have been given up, and on December 21, 1758, Goldsmith was rejected at Surgeons' Hall as "not qualified" for a hospital mate. Possibly he tried Dublin again after this unexpected repulse. Anyhow, he called himself, on March 31, 1763, "M.B." in an agreement with James Dodsley (written throughout in his own hand, and still extant in the British Museum) to write a Chronological History of the Lives of Eminent Persons in Great Britain and Ireland. It was stipulated by Goldsmith in that agreement that he should "print his name to the said work," which as a matter of fact was never completed; but in the first publication issued in his own name—viz., "The Traveller," published in December, 1764—he is described on the title-page as "Oliver Goldsmith, M.B." If, therefore, we assume that this medical degree was a Dublin one, it must have been granted between 1756, when he returned to England, and 1763, the date of his agreement with Dodsley.

Of course at that period Oliver was a man quite unknown in the literary world, and if he was granted a degree at Dublin, the papers would probably not record it as an item of news in the way that the Oxford paper did in 1769, when Goldsmith had an established reputation as a poet, a novelist and a playwright. Yet it would seem possible that exploration amongst the Irish newspapers of the day might solve the Dublin difficulty in the same way that the one at Oxford has now been cleared up. In any case, it is obvious that Oxford relied on Goldsmith's having already the Dublin degree of "Batchelor of Physic" in giving him its own degree of M.B.; and it is inconceivable that he went down with Johnson and Percy to obtain an ad eundem degree on false pretences, which could have been so easily shown up if as a fact he was not a medical graduate of Dublin.

Dr. Kirkpatrick writes to me that he has already gone carefully through a file of Dublin newspapers from 1755 to 1768 without finding any trace of a medical degree for Goldsmith, though many of the degrees given by Trinity College are recorded therein. He is, however, kindly continuing his researches, and it may be hoped that some day he may light upon confirmatory evidence of what, if I have made my argument clear, seems now established beyond reasonable doubt—viz., that Goldsmith obtained from Dublin at some date prior to 1763 (when he signs himself M.B. in his agreement with Dodsley) the degree of Bachelor of Physic, and that Oxford on the strength of this gave him its ad eundem degree of M.B. on February 17, 1769.

We may therefore dismiss as unfounded the conclusion of the only medical writer who, so far as I can gather, has discussed the question, "Was Goldsmith a Physician?" Dr. John Morris, of Baltimore, U.S.A., who died, aged 79, in 1903, read in 1896 before the Johns Hopkins Hospital Historical Society (an organization evidently akin to this Section) an elaborate paper with the above title, which appeared in full in the *Journal of the American Medical Association*, 1896, xxvi, pp. 953-57. Dr. Morris's final judgment was:—

> "It would be to me the highest pleasure could I truthfully claim this great man, for so Dr. Johnson terms him, as a member of our profession, but after very faithful research, with an honest hope that I could discover proofs of his having obtained a medical degree, I am constrained to declare that his education did not fit him for a professional life or that any university, under the most lax conditions, could have granted him a degree. Therefore the verdict must be, in Scotch fashion, 'not proven.'"

I trust you will think that with the fresh information that I have laid before you, it is *proved* now.

Mr. D'ARCY POWER said that Sir Ernest Clarke had asked him to take charge of a part of his paper with which he did not feel himself competent to deal. It concerned the cause of Oliver Goldsmith's death. Goldsmith had long been troubled with symptoms of renal disease, and as early as 1770 to 1771 he had spent some time at Bath, probably for the cure of a "gouty kidney." In 1773 he was suffering again from dysuria, but he improved under treatment, and in March, 1774, he went to a farmhouse at Hyde, near Hendon. Here he was taken ill on March 25, becoming feverish and having a fresh attack of dysuria. He seemed so weak and his pulse was so bad that his apothecary became frightened and sent for further advice. A little improvement took place, but the patient persisted in dosing himself with James's powder—a preparation of antimony which he had himself recommended in "Little Goody Two Shoes." At midnight on Sunday, April 3, he was in a sound and calm sleep, but his condition clearly caused anxiety, because "the gentleman who attended him" was on the alert, and at 4 a.m. he was found to be "in strong convulsions, which continued without intermission until his death at 4.45 a.m. on April 4, 1774. The report of the case had been submitted to Dr. Philip Hamill, the medical pathologist at St. Bartholomew's Hospital, who replied that the symptoms strongly suggest a *Bacillus coli* septicæmia from an old pyelitis, complicated by excess of antimony in the James's powder.

Two Early Eighteenth Century Treatises on Tropical Medicine.

By Albert J. Chalmers, M.D., and Captain R. G. Archibald, R.A.M.C.

We have in our possession two early eighteenth century treatises on Tropical Medicine which appear to be of sufficient interest to justify a short description. They are:—

(1)

TRAITÉ
DES
MALADIES
PARTICULIERES
AUX PAYS
ORIENTAUX,
ET
DANS LA ROUTE,
ET DE LEURS REMEDES:

Par Mr. D.L.F. Docteur en Medecine,
qui a voyagé & ſejourné dans les principales Villes des Indes Orientales.

A ROTTERDAM
CHEZ JEAN HOFHOUT
MDCCXXVI

(2)

THE
SEA-SURGEON
OR THE
Guinea Man's
VADE MECUM

In which is laid down,

The Method of curing ſuch Diſeaſes as
uſually happen Abroad, eſpecially on
the Coaſt of *Guinea;* with the beſt way
of treating Negroes, both in Health
and in Sickneſs.

Written for the Uſe of young Sea Surgeons,

By T. AUBREY, M.D.

Who reſided many Years on the
Coaſt of *Guinea.*

LONDON
Printed for JOHN CLARKE at the *Bible*
under the *Royal-Exchange*
MDCCXXIX

The first treatise forms the second or medical portion of Le Sieur Luillier's "Nouveau Voyage aux Grandes Indes," which is bound in old Rotterdam binding and was printed in that city by Jean Hofhout in 1726, after it had been approved by De L'Isle on May 3, 1725, in Paris, as fit for publication. We have been unable to trace the author's name, as he merely writes under the appellation of D.L.F.

The second treatise, which is also handsomely bound in leather, was printed by John Clarke at the *Bible* under the Royal Exchange in London in 1729. It was dedicated to Dr. Daniel Turner (1667-1741), of the College of Physicians of London, who was a celebrated surgeon in London in the early eighteenth century, and who wrote treatises on

"Skin Diseases," "Surgery and Venereal Diseases," and a curious work on "Two Cases of Insects voided by the Urinary Passages." His works are cited by Dezeimeris and by Hirsch. He died on March 13, 1740. Aubrey, however, was not sufficiently celebrated to receive notice in biographies.

Both books appear to have been entirely unknown to such authorities on medical bibliography as Hirsch and Dezeimeris, and are merely mentioned in Castellani and Chalmers's second edition of their book on Tropical Medicine, and nowhere else as far as we are aware. They are both small octavo, the French or Oriental treatise consisting of only 35 and the English or Occidental treatise of 135 pages, excluding titles, prefaces, indices, &c.

THE ORIENTAL TREATISE.

This little work deals with sea-sickness, scurvy, the colics of Madagascar, the venereal diseases of the Island of Dauphiné, the fevers of the Indies, a disease called *mordechi*, the dysenteries, a disease in which the patients are called "*esfalfados*," small-pox, snake-bite, *bicho*, and lastly the essence of Persia and the cephalique. By far the most interesting chapter is that called "*Du Mal que les Portugais appellent Bicho*." The author states that the word *bicho* in Portuguese signifies an earthworm or a small animal. He also states that there are three varieties of *bicho* which are peculiar to Brazil. The first is obviously the Guinea-worm, *Dracunculus medinensis* (Linnæus, 1758), and of this he gives a brief but good account. The second is equally obviously the jigger, *Dermatophilus penetrans*, Guérin, 1838, which is believed to have been first mentioned by Oviedo in 1547 and is briefly described by Thevet in 1558 under the name "Tom," and later by Léry, by Hans Staden, who used the name "attun," by Schmiedel, and by Piso, but D.L.F.'s description is most excellent. The third form, however, is by far the most interesting, as it is the earliest reference we have seen to the disease called by Ackers and Manson "*epidemic gangrenous rectitis*," and which they describe as being named *caribi* in British Guiana and *bicho* or *el becho* in Venezuela. D.L.F.'s description, which practically represents our present knowledge, and is remarkably similar to the description given to-day, is as follows:—

"Les Portugais habituez au Bresil appellent encore Bicho, une inflammation du fondement, qui est également frequente & dangereuse dans ce pays, elle est toujours suivie du mal de tête, d'épreintes, grande chaleur en la partie malade, & quelquefois de la fièvre. Si l'on la neglige il s'y fait en peu de jours des ulceres venimeux, qui ont donné lieu au nom de Bicho.

"Ceux qui se lavent souvent ces parties, sont moins sujets à cette incommodité que ceux qui ne le font pas. D'abord qu'on s'en croit attaqué, il faut étuver plusieurs fois le jour, la partie avec une décoction de limons, à laquelle on ajoutera quelques grains de sel. L'on introduit aussi heureusement dans l'intestin, des petits quartiers de limon, & cela arrête quelques-fois le mal tout court dans son commencement ; s'il y a déja une corruption notable, l'on a de coutume de détremper de la poudre à canon dans de l'eau de rose, ou de l'eau de plantain, & de ce liniment l'on en imbibe de petits linges, que l'on met dans le fondement. Après l'avoir bien étuvé avec la décoction de limons, quoy qu'il y ait de la fièvre, il faut bien se donner garde de saigner dans cette occasion. l'experience ayant fait connoître que ce remede est fort préjudiciable ; l'on peut seulement donner frequemment des lavemens anodins ou détersifs, suivant que la corruption ou l'inflammation, sont plus ou moins grandes, & purger doucement sur la fin."

The remainder of the little book is not of equal interest to the chapter just quoted. The author begins his remarks on tropical diseases with a short chapter on sea-sickness, in which a preliminary purgation is recommended before starting on a voyage and rest during the first few days after embarkation. This subject, so important to the traveller, is usually ignored in the modern text-book on tropical medicine.

The second chapter is devoted to scurvy, or *mal de terre*, which was considered to be contagious, but it was noticed that the common seamen were more usually attacked than the officers, a fact held to be due to the inferior quality of food, which together with the salt therein was thought to be the causal agent. Accounts of the disease and of its treatment are also given. "With regard to prophylaxis, it was considered to be the duty of the officers to allow only good food to be taken on board and to provide lemon-juice, sour grapes, ressolis, confits and dry fruits, and particularly prunes. Food which was not fresh or which had not been well desalted was to be avoided. On long voyages twenty to thirty drops of the spirit of sel dulcifié is recommended to be taken two to three times a day and during an attack every two hours, and from time to time to be used as a wash for the mouth."

The next chapter deals with the colics of Madagascar, which he considers to be due to drinking brandy, associated with the hot climate. These attacks would appear to have been dysenteries, as they were associated with fever, tenesmus, and sometimes difficulty in passing water, as well as by a great change in the appearance of the patient. They were said to resemble the colics of Poitou. The Negroes were found to suffer less frequently and less severely than the French, which the author ascribes to the fact that they did not drink brandy and were more accustomed to the climate. These colics were treated by bleeding from the foot, by fomentations, baths, and pills of laudanùm, but purgatives were avoided.

Venereal diseases were very common among the natives of the Isle of Dauphiné and were treated by purgatives if recent, and by the application of red-hot irons to the soles of the feet if chronic.

With regard to the fevers of the Indies, he describes a simple continued fever and the single and double tertian fevers. Blood-letting from the foot is recommended as an important remedy.

Under the term *mordechi* the writer describes some dangerous diarrhœal disorder which can kill the victim in a few hours and which in all probability was endemic cholera. For this he recommends burning the feet with a red-hot, thin, long needle until the patient shows by his cries that he feels the pain.

The chapter on dysenteries is not particularly interesting.

It is difficult to understand what he means by the term "esfalfados," which was applied by the Portuguese to persons worn out by debauches with women, when they suffered from great dryness, heat, alteration, insomnia, nausea, and continued fever, the pulse being irregular, sometimes strong, sometimes very weak, and the urine very red in colour but always clear. This condition may possibly have been "climatic bubo," with which the symptoms somewhat agree, and perhaps milder forms may have been "oxaluria."

Another chapter is devoted to small-pox and the next to snake-bites, concerning which he mentions the treatment of by means of Piedra-de-cobre, or snake stone.

He mentions two medicines which we have failed to recognize—viz., the essence of Persia and the essence cephalique, both of which are good for apoplexy, and the former for epilepsy and is also an emmenagogue.

Occidental Treatise.

This little book is really a treatise for the benefit of medical men connected with the slave trade, as it concerns itself with two problems: firstly, the reason of the death-rate among slaves on board ship and its prevention, and secondly, the diseases of Europeans while obtaining the slaves on the West Coast of Africa.

With regard to the unfortunate slaves, the writer gives some excellent advice to the surgeon, "who must demand authority over the treatment of the slaves from the owners in the presence of the Captain." He then describes the food commonly used by the natives on the Coast and proceeds to state that though it is impossible to give them this food on board ship, still it is quite possible to modify the ship's food so as to make it palatable to them by removing salt by means of water and by giving them oil and pepper. Constipation should be treated not by blows but by medicines, and the poor wretches should not be douched with cold water when obviously ill. Apart from the question of food he appears to consider yaws to be a cause of death among slaves on board ship. By yaws he probably referred to *frambœsia tropica*, but he most certainly also included *syphilis* and *gonorrhœa* under this term.

With regard to the diseases of Europeans, it would appear that the writer was of a philosophical turn of mind, as he endeavours to trace a causation on physiological grounds for the diseases he describes; moreover, his prescriptions appear to be elegant. He, however, did not recognize small-pox as such, though he described the signs and symptoms quite well. This is astonishing, as it is definitely recognized in the French treatise mentioned above.

The book commences with a theoretical chapter dealing with the author's ideas as to the cause of a disease. He says:—

> "Its cause arises from the conveyance of some noxious particles into the circulating juices of the body, whether by the air in respiration or by food impregnating the chyle with unnatural corpuscles."

He believed that a fever was a præternatural heat all over the body excited by means of a vicious kind of air altering the fluids and depriving them of their natural motion. Moreover, he believed that the particles of the air which caused fever entered the body though the pores of the skin. In a simple fever the fluids of the body circulated more vigorously than normal, but in a putrid fever these fluids circulated less vigorously and were even stopped by coagulation. These opinions are obviously applicable to modern views with regard to malaria and its pernicious forms. The diseases which he considers may be grouped into: (*a*) the fevers, (*b*) filariasis, (*c*) the diarrhœas and dysenteries, (*d*) intestinal obstruction and colic, (*e*) quinsy and pleurisy.

The Fevers.—He classifies the fevers which he describes into simple ardent fevers, putrid fevers, intermittent fevers. The simple ardent fevers are neither very dangerous nor of long continuance, and judging by his description one form at least of these fevers—viz., that which abated by the seventh day—must have been "dengue fever." The symptoms were great thirst, moderate heat, which commonly augmented till about the fourth or fifth day, white tongue, and red visage. The fever either abated by the seventh day or passed into a putrid fever. For the treatment of this dengue fever he prescribed purgatives, tamarind, rhubarb and senna, and after they had acted, potassium nitrate and lime-juice. The putrid fevers appear to be definable as small-pox, yellow fever, heat-stroke, pernicious malaria. In the first variety, which we consider to be small-pox, he describes a milder and a severer form. The milder type begins with fever lasting three, four or five days, after which large red pustules appear. The more dangerous variety, which is obviously hæmorrhagic small-pox, is characterized by the fact that instead of pustules only purple spots appear. This form of fever is very dangerous. His second variety of putrid fevers appears to be endemic yellow fever. He says that it begins with vomiting, florid visage, sparkling eyes, yellow tongue with an evil dark colour in the middle, teeth black and clammy with filth, breath very stinking, and difficulty of respiration. "These patients are almost continually raving, though sometimes they rave not, but are always drowsy and stupid and discharge very copiously cold noisome sweat which is also exceedingly dangerous." Moreover, he describes under the heading of putrid fevers sudden death in the middle of the night, or in people after exposing themselves to night air, by which is probably meant two diseases,—viz., heat-stroke and a form of cerebral malaria. With regard to the intermittent fevers, he only distinguished quotidian and tertian fevers and does not appear to have noted quartan fevers. These he believed came from food and not from air, and in the treatment he states "you must never have an immediate recourse to the 'cortex,' because although it may impede the return of another access yet the patient will be incommoded with distension, inflammation, retchings, headache, and other symptoms which denote an imperfect cure." He did not approve of phlebotomy, but considered that the first treatment should be cathartics and sometimes emetics followed by cortex. He advises a low diet. In prescribing cortex sometimes he uses the South American Indian term "Quina Quina" and at others "Cortex Peruvianas."

Filariasis.—He devotes a short chapter to filariasis under the heading erysipelas, and considers it due to drinking palm wine and brandy mixed as a punch and exposing the body unwittingly to noisome fogs. His treatment was by bleeding, gentle purgation, low diet, and the local application of emollients and dissolvents.

Diarrhœas.—Under the heading diarrhœa he distinguishes between a dysenteric fever with blood and a diarrhœatic fever without blood. His treatment was with general evacuations, diaphoretics, and anodynes, but he did not believe in ipecacuanha which he says so many esteem as an "infaillible" remedy. Evidently he was dealing with bacillary and not with amœbic dysentery.

Other Diseases.—He devotes a chapter to intestinal obstruction, variously called iliac passion or *miserere mei*, and another chapter to colic, and also a couple of short chapters to quinsy and pleurisy.

REMARKS.

These books are interesting as they enable us to recognize with more or less certainty the presence of the following tropical diseases in South America, India, and West Africa early in the eighteenth century.

In South America: Dracontiasis. Dermatophiliasis. Epidemic gangrenous rectitis.

In India: Simple continued fever. Malarial fevers—simple tertian, double tertian. Cholera. Dysenteries. Small-pox. Climatic bubo (?).

In West Africa: Malaria—tertian, quotidian, pernicious. Endemic yellow fever. Dengue fever. Small-pox. Filariasis. Diarrhœa and dysentery. Yaws.

We are of the opinion that the above works extend our knowledge of the history of epidemic gangrenous rectitis by about a hundred and seventy years, and that of dengue fever by about fifty years—i.e., from the description given by Bylon in 1799 to that by Aubrey in 1729. If we are correct in our diagnosis of yellow fever from Dr. Aubrey's description, it goes far to support the late Sir Rubert Boyce's opinion that yellow fever had for long been endemic on the West Coast of Africa, for it will be observed that Dr. Aubrey is not describing epidemic but endemic diseases. With regard to the hæmorrhagic form of small-pox, this was by no means rare in the experience of one of us in the late nineties of last century on the Gold Coast. Although D.L.F. describes the jigger as prevalent in Brazil in 1726 no mention of this little insect is made by Aubrey, who, however, omits any mention of the Guinea-worm, which had already been described by Velschius as existing on the West Coast of Africa. The absence of the reference to the jigger is in accordance with the belief that it was not introduced into West Africa from Brazil until the middle of last century.

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A Note on Nathaniel Highmore, M.D. [1613-1685], and his Memorial Tablet in Purse Caundle Church, Dorset.

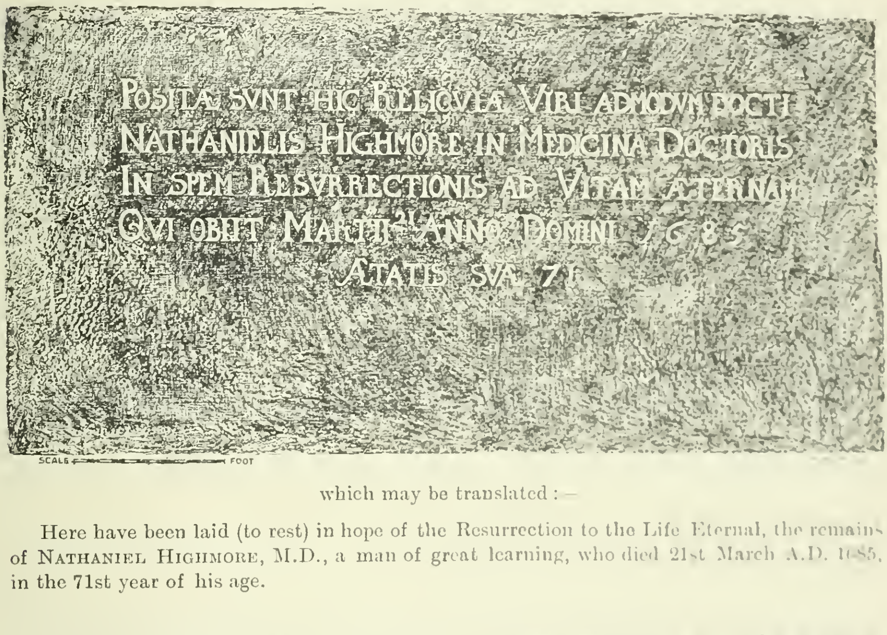
By W. de Courcy Prideaux.

I had occasion some time since to visit Purse Caundle, near Sherborne, to take records of the memorial brasses there, and in course of inquiries I found that Dr. Nathaniel Highmore was stated to be buried there, and that an inscription to his memory had been placed in the chancel. Inspection, however, failed to discover this, but further inquiry, after I had published the brass rubbings, satisfied me that it must be at Purse Caundle, and I made a special visit. I was rewarded by finding a portion of the slab protruding from below the chancel floor. The Rector very kindly granted me leave to have a portion of the flooring removed, and to my great delight I saw the whole uncovered, and, the dust of years being removed, I was able to secure the rubbing I now have the pleasure of showing you to-day (*see* figure).

This gentleman, son of Nathaniel Highmore, Rector there in 1613, was born at Fordingbridge, in Hampshire, matriculated at Queen's College on November 4, 1631, and was elected scholar of Trinity College, Oxford, 1632, proceeded to Bachelor in Physic, 1641, and next year M.D. He practised with great success at Sherborne, never taking a fee of the clergy, among whom he had great practice, and was many years Justice of the Peace for the County. He published "Corporis humani Disquisitio Anatomica," 1651, folio, to which he added an appendix, but died before it was finished; "The History of Generation: with a

General Relation of the Manner of it as well in Plants as Animals," London, 1651, 8vo; "Discourse of the Cure of Wounds by Sympathy," London, 1651, 8vo; "De hysteriâ passione, et de affectione hypochondriacâ: theses duae Oxon et Amstel," 1660; "Considerations on Scarborough Spa," and an "Account of the Springs at Farringdon and East Chinnock," in the *Philosophical Transactions*.

At present hidden below the oak Chancel floor of Purse Caundle Church, of which Parish his father and other relatives were Rectors from 1603 to 1717, is this black marble Slab — To the Memory of the celebrated Anatomist and Writer, who, elected scholar of Trinity in 1632, was M.D., Oxon., 1642. He practised with success at Sherborne: was for many years J.P. for the County of Dorset, and greatly beloved by rich and poor.


POSITÆ SVNT HIC RELIQVIÆ VIRI ADMODVM DOCTI
NATHANIELIS HIGHMORE IN MEDICINA DOCTORIS
IN SPEM RESVRRECTIONIS AD VITAM ÆTERNAM
QVI OBIIT MARTII 21 ANNO DOMINI 1685
ÆTATIS SVÆ 71
SCALE
FOOT

which may be translated: —

Here have been laid (to rest) in hope of the Resurrection to the Life Eternal, the remains of NATHANIEL HIGHMORE, M.D., a man of great learning, who died 21st March A.D. 1685, in the 71st year of his age.

He discovered a new duct in the testicles; and from him the antrum Highmorianum, or great cavity in the maxilla, took its name.

By his will, dated March 4, 1684, he left an annuity of £5 to be raised out of his houses in the Borough of Newland, in Sherborne, to a poor boy sent from the free Grammar School there, by the free choice of the governors to the University, for the term of six years, and so from time to time during the term of seventy-six years. To the master of the almshouse in Sherborne the sum of £50 to be employed in erecting a workhouse, if they shall go about such a work. His twenty-one copper-plates of anatomical figures to the Royal Society; and his long table of muscles to the physic-school at Oxford. His executors were his brother, Richard Highmore, of Purse Caundle, clerk, and his cousin, William Highmore, of Winterborne, clerk; his residuary legatee, his cousin, Nathaniel Highmore, clerk. A small head of him makes a frontispiece to his text-book on anatomy, published in 1651, folio.

> "The Hon. Mr. Boyle to Mr. Oldenburg.
>
> "Oxford, August 29, 1664.
>
> "I was visited in Dorsetshire by the ingenious Dr. Highmore, from whom I had some odd anatomical observations, wherewith I may hereafter acquaint you. I shall rather tell you now that he is a great florist; and finds by experience that there is scarce any mold comparable for flowers to the earth which is digged from under old stacks of wood, or other places where rotten wood has long lain."

He was evidently a many-sided man and did not content himself with the study of medicine, his varied interests keeping his mind fresh and alert.

I find that Edward Highmore was instituted to Purse Caundle Rector in 1603; Nathaniel Highmore (father of the physician), as Rector in 1613; Edward Highmore, living there in 1645; Richard Highmore, instituted May 15, 1695, and died in 1717. So, for more than a century, Highmores were Rectors of Purse Caundle, and it would seem a great pity that this fine marble slab should be allowed to remain in obscurity below rotting timbers, seeing it is the only memorial existing to a man whose name is so often used by the healing fraternity at large.

Mr. C. J. S. Thompson showed many interesting specimens from the Wellcome Historical Medical Museum. Amongst others were a donarium from Brandon, in Suffolk, of a woman in the seventh month of pregnancy; a leaden ointment box of Roman make; and an early woodcut of a stegomyia, dated 1649.

Section of the History of Medicine.

October 10, 1913.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

The Medicine of the Babylonians and Assyrians.

By Morris Jastrow, jun., Ph.D.[1]

I.

Hippocrates, as you are aware, introduces his aphorisms—or must we say the aphorisms ascribed to Hippocrates—by the famous reflection, "Art is long and time is fleeting." My subject is large, very large, and my time—or rather your time—limited. I must, therefore, resist the temptation of any long introduction, though I cannot forbear expressing my deep appreciation of the honour involved in being asked to address this distinguished company. I would, however, fail in frankness did I not add that my pleasure is tempered somewhat by my diffidence in addressing you on a subject which, to be properly presented, requires the combination of a physician, a botanist, and an Assyriologist.

The situation, however, is characteristic of the interpenetration of fields of research in our days, obliging the student in one field frequently to cross over into an adjacent one, despite the danger-sign "No Trespassing" that may be staring him in the face. The only one warned off by such a sign is the special specialist of the type—so successfully "made in Germany"—who devotes his life to the study of the Dative case in Latin, only to regret on his deathbed that he had not confined himself to the ethical Dative. In the American Cambridge there is a street known as "Divinity Avenue," at the head of which is a sign-post reading ominously "Dangerous Crossing." You read the sign carefully, and then cross as the only means of getting to your goal

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[1] Professor of Semitic Languages in the University of Pennsylvania.

The student of history is constantly obliged to cross over into the domain of law, economics, and military strategy. The philosopher who has a message encroaches on what the theologian is accustomed to regard as his province. Modern medicine is closely intertwined with the new chemistry, and when we are dealing with a complex civilization such as that of Ancient Babylonia and Assyria, the student of Assyriology finds himself at a disadvantage in not having the proverbial nine lives of a cat, so as to be also an historian, an economist, a philosopher, a theologian, an astronomer, a chemist, a botanist, a zoologist, and a physician.

With a frank confession that I own to merely one life, and that my knowledge of medicine is the layman's learning, which you will agree with me is usually too little to be even dangerous, I will proceed—to trespass.

II.

Our knowledge of the medicine of the Babylonians and Assyrians is derived almost exclusively from the great library of clay tablets gathered in his palace by King Ashurbanapal of Assyria, who ruled from 668 to 626 B.C., and which was discovered by Sir Austen Henry Layard in 1849 in the course of his excavations at the mound Kouyunjik, opposite Mosul, the site of Nineveh, which was the capital of the later Assyrian Empire. About 30,000 fragments of the clay tablets of the collection, which may well have numbered over 100,000 when complete, have found their way into the world's greatest treasure-house — the British Museum. The term "library" may justly be applied to the collection, for there is scarcely a branch of knowledge that is not in some way, and to some extent, represented. Through the remains we are enabled to form an estimate of the intellectual achievements of both the Babylonians and Assyrians, for although the tablets date from the comparatively late reign of Ashurbanapal, the collection represents for the larger part copies made from older originals by the scribes of the Assyrian king who were sent to the temples in the south to copy the literary remains of the past that had been gathered in the course of many centuries in the archives of Babylonian temples. The largest place in the collection is taken by the religious literature, within which several divisions may be recognized, omens of all kinds, incantations—the latter shading off into prayers, and these unfolding into hymns, myths, and legends, all with a religious background—and we also have the remains of an extensive national epic. The text-book literature, consisting of sign lists and of word lists, of grammatical exercises and of commentaries to texts, constitutes a second division, while a third is formed by the official correspondence of Ashurbanapal and some of his predecessors, including reports of various kinds made to the rulers.

Included in the collection are also several hundred medical texts—indeed at least 800 fragments may be placed in this category,[1] though, for a reason that will presently become clear, the dividing line between a medical text and an incantation on the one hand, or an omen text on the other, cannot always be sharply drawn. Outside of Kouyunjik very few medical texts have as yet come to light,[2] one of the few specimens it will be my privilege to place before you. No doubt this paucity of medical texts outside of Nineveh is accidental, for the medical section in the royal Assyrian library is clearly of Babylonian origin; and in the course of time large numbers of medical texts must have been gathered in the temples of Babylonia.

We have no definite means of determining the age of the medical tablets from which the scribes of Ashurbanapal made their copies. A general feature of these texts, which holds good, however, for all the other sections of Babylonian-Assyrian literature, is their composite character, containing by the side of later elements much that is far older. It is characteristic in general of the literary productions of the ancient Orient that the old is preserved alongside of the new. The Pentateuchal Codes of the Old Testament may serve as an example, where often in the same chapter very ancient practices, revealing in an unmistakable manner the primitive ideas on which they rest, are incorporated with laws that belong to a far more advanced and later age. So in the medical texts of the royal library we have the accumulated experience of the past combined with the science of the age in which the compilation was made. If dates are desired, one may say in a rough way that the treatment of disease as revealed in the medical text of Ashurbanapal's library must revert to a period of at least 2000 B.C. The proof for this is to be found in the famous code of Hammurapi (a more correct pronunciation than Hammurabi), dating from *circa* 1950 B.C., in which not only the word for physician, *Asu*, signifying "healer," occurs, but where we find included in the portion of the code devoted to injuries the laws in regard to the fees for surgical operations, as well as the fines for fatal errors on the part of the surgeon.[1] No doubt you are familiar with those regulations which, curiously enough, fix the fee in the case of a successful operation according to the station occupied by the patient. The ordinary freeman pays, e.g., for a successful operation on the eye or elsewhere 10 shekels (less than £1), while a member of the ruling class gets a reduction of 50 per cent.; and in case the operation is performed on a slave, the owner of the slave pays 2 shekels. For the setting of a bone or the cure of some internal injury the fee is 5 shekels, which is reduced to 3 shekels if the patient is of higher rank. The punishment for the failure of an operation, on the principle that the physician had no right to take the risk, similarly varies according to the position of the patient. If he be a slave who in consequence of the operation dies, the surgeon is to replace the slave by another; if the slave loses an eye the physician must pay one half of the value of the slave. If, however, it is a freeman who dies as a result of the operation, or if the eye of a freeman is destroyed through the operation, the procedure is quite simple—the physician's hand is cut off.

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[1] *See* Bezold's "Catalogue of the Cuneiform Tablets in the Kouyunjik Collection of the British Museum," vol. v, *sub.* "Ceremonies" and "Incantations." At the time that this catalogue—a monument to its learned author and a vast mine of information—was published, it was not possible sharply to differentiate between (*a*) omen texts dealing with abnormal and pathological symptoms on the human body, (*b*) medical texts with magic rites, and (*c*) medical prescriptions with a minimum of incantation formulæ. All three classes are included under the rubrics named. As a consequence it will not be possible to estimate the *exact* number of medical texts in the proper sense contained in the library until after the publication of all the tablets of the three subdivisions.

[2] A few lines from a medical text with magic rites from a tablet in the Constantinople Museum were translated by Scheil in the "Recueil de Travaux relatifs à la Philologie et l'Archæologie Egyptiennes et Assyriennes," xxii, p. 160 *et seq.* The text, as Professor Scheil informs us, is of the Neo-Babylonian period. There are no medical texts, apparently, in the Louvre Museum, but there are two catalogued as such in the University of Pennsylvania collection.

Such regulations point on the one hand to established medical treatment, but on the other, in the inclusion of surgical operations among "injuries,"; and in the attempt to apply the *lex talionis*—the legal *quid pro quo* principle—to medical practice, there is revealed an aspect of medicine distinctly primitive, and which warns us against going too far beyond the time of Hammurapi for the beginnings of medical treatment, except as an accompaniment of incantations and magic rites.

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[1] §§ 218-223. The Code was first published by Scheil in vol. iv of the "Mémoires de la Délégation en Perse," Par., 1902, pp. 4-162, since which time an extensive literature has grown around this remarkable document. An English translation in convenient form was published by C. H. W. Johns, "The Oldest Code of Laws in the World," Edinb., 1903. Another edition of the text, with transliteration and English translation, was also published by Professor R. F. Harper, under the title of "The Code of Hammurabi," Chicago, 1904. The most recent translations are by Professor Arthur Ungnad in co-operation with Professor Jos., Kohler, "Hammurapi's Gesetz," Leipz., 1911, and by R. W. Rogers, "Cuneiform Parallels to the Old Testament," New York, 1912, pp. 395-465.

The circumstance, too, that the code of Hammurapi makes scarcely any provision for other forms of medical treatment than surgery may be taken as an indication that at that period medicine in general had not yet developed to the stage in which we find it in the medical texts proper.

Before leaving this subject, it may be interesting to point out as an indication of the beginnings of specialization in surgery that the code distinguishes between the ordinary surgeon and the veterinary, the latter being spoken of as "the cow and sheep healer."[1] On the other hand, in the medical texts, so far as published, surgery is not introduced. It would seem from this that the physician as surgeon was sharply differentiated from the healer of diseases, and perhaps not placed on the same level with the latter. However this may be, the sharp distinction between surgeon and physician reminds us of the custom prevailing in Great Britain and which may, in some of its aspects, be a survival from a very early period.

III.

It will not have escaped your notice that in speaking of the medical texts in Ashurbanapal's library I have already indicated the two avenues of approach leading to medicine—to wit, incantations, accompanied by magic rites on the one hand, and divination practices on the other. A few words must be said about each, in order to clarify the position occupied by medicine in the general scheme of Babylonian-Assyrian civilization. The approach from the side of incantations is, of course, a familiar phenomenon in the development of medicine everywhere. The belief that disease is due to demoniac possession is universal at a certain stage of human culture, but in Babylonia and Assyria this belief is extended to include all the mishaps and accidents of life. It was a convenient theory to shift the blame for anything disagreeable that happened to you from yourself, where it generally belonged, to someone else. The first act of man, according to the Bible, was to indulge in this weakness. The woman in that oldest of garden parties takes the place of the demon, and the woman shifts the blame on to the serpent, who is *really* a demon. So far as disease and physical ills are concerned, the theory was one that would naturally suggest itself. Even the unsophisticated child of to-day—a specimen that is fast dying out under the strain of the new pedagogy—might be led to the conclusion that a violent cramp in the stomach, or a throbbing of the head, was due to something alive that had found its way inside the body; and strange to say, modern medicine would tend to confirm the childish notion in the case of many diseases, now ascribed to the action of noxious germs which are certainly very much alive. Primitive man, standing under the influence of a widespread belief that everything that manifests power or growth is alive—a theory to which the name Animism has been given—thus becomes the unconscious originator of the modern germ theory, but he personified the germs by giving them a human or an animal shape, or a combination of the two (fig. 1). The Babylonians and Assyrians also differentiated their demons, just as we do our germs. There was a special demon, *Ashakku,* for a wasting disease, probably a form of tuberculosis. Another demon, with the appropriate name of *Akhkhazu,* "the Attacker," was the demon

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[1] § § 224, 225 of the Code stipulate the fee of the veterinary in case of a cure as one-sixth of a shekel, and in case the cow or sheep dies, impose a fine on the veterinary of one-fourth of the value of the animal.

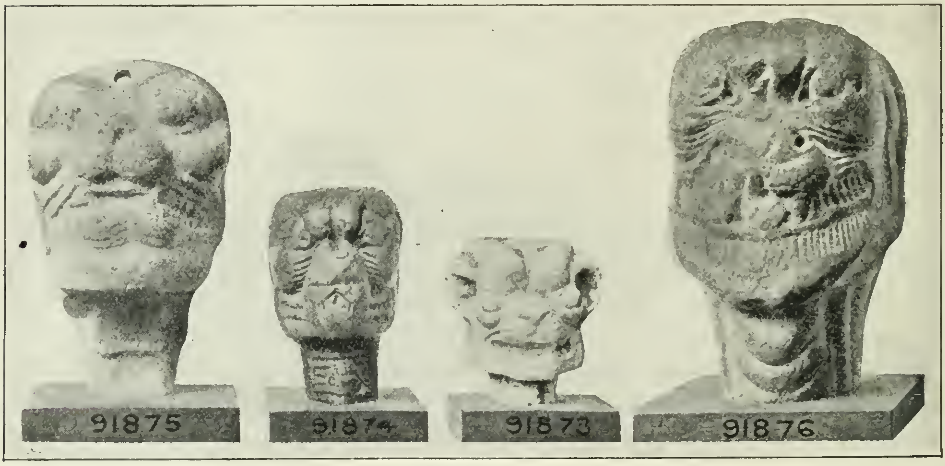

Fig. 1.[1]

Heads of Babylonian and Assyrian Demons. Photographs from objects in the British Museum and reproduced by kind permission of Messrs. Luzac and Co., from R. C. Thompson, "The Devils and Evil Spirits of Babylonia," Lond., 1903, i, Pl. ii.

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[1] The reproduction of illustrations from texts and objects in the British Museum is by kind permission of the Trustees of the British Museum. Figs. 2 and 3 are from cuts made for the Numismatic and Antiquarian Society of Philadelphia; they are kindly lent by the Society, for which acknowledgment is hereby made.

of liver troubles. *Labartu* was a gynæcological demon, pictured as a horrible monster, with swine sucking at her breasts, who was made responsible for the death of infant children, and of women in childbirth; and so on through a long list. A cure, therefore, involved driving the demon out of the body, either forcing him out or coaxing him out. Incantations as a means of bringing this about are therefore to be viewed as the antitoxins of primitive medicine, acting primarily on the demons, and merely as a resultant incident bringing about the cure of the patient. Even language in ancient days falls under the spell of the animistic theory, for since words have power, they too are alive. The mystic sounds of speech, the sound of thunder, the sound of the wind, the roaring of the sea, the rustling of the leaves—all were imbued with life. I need only remind you of the part played by the "Word" of God in the first chapter of Genesis, and of the doctrine of the Logos, or the "Divine Word," in the Gospel of John, which becomes the basis of Christian theology, to show how even in the advanced forms of thought we are still at the mercy of animistic conceptions; just as we find it difficult, even nowadays, to picture an infinite power without falling back into the language of animism.

Babylonian-Assyrian medicine never cut loose from this close association with incantations. Combined with incantations, moreover, certain ceremonies were enacted, in order to symbolize the manner in which the relief of the patient from the grasp of the demons was to be expected. These rites lead to the actual introduction of medical remedies. By the side of what we may call "direct sympathetic magic," such as the tying of knots in a cord, to symbolize the hoped-for imprisonment of the demon after he had been driven out of the body, or placing a little boat made of some material on the waters, to symbolize the expected departure of the demon, we have in a well-known text[1] a variety of indirect methods, such as the peeling of an onion and throwing one peel after the other into the fire to the accompaniment of formulæ, emphasizing the hope that, as one peel after the other is consumed in the fire, and the onion will never take root or blossom again, so the demon might never reappear. Following the symbolical act with the onion, the text proceeds to the enumeration of other materials, such as dates, palm blossoms, bits of sheep and goats' skins, wool, and certain kinds of seed, which are similarly thrown into the fire to the accompaniment of appropriate formulæ, all expressive of the same hope as in the case of the onion.

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[1] Shurpu Series, Tablets V-VI, 50-143, published by Zimmern, in "Beiträge zur Kenntniss der Babylonischen Religion," Leipz., 1901. Similarly, in another incantation series known as Marklû, published by Tallqvist, "Die Assyrische Beschwörungsserie Maqlû," trees, plants, herbs, and weeds are introduced in connexion with magic rites, such as *ninu* (mint), *khaldappan* (perhaps "oleander"), cassia, *pu*-plant, chicory, grain, herbs like *upuntu*, *mashtakal*, and *sapparu*; *sikhlu* (a weed), *lardu*, *sammu*, *araru*, *nulukhkha*, *kan-kal*, and *an-khul*, tamarisk tree, seeds of the *ushu* tree, cedar, *she-u-ku* wood, as well as oil, fat, honey, flour, stones—e.g., Tablet I, 21-26, and 46; III, 177-179; IV, 38 (images of tamarisk, cedar, and fat; *cf.* II, 113, of "honey"; 147, of sesam grain; 208, of cedar and tamarisk; 187, of pitch smeared with fat); V, 4, 11-17, 30-37 (a list of eight herbs and plants), 53, 54; VI, 35-38, 61, 62, 76-84, 108, 109; VII, 31 (various oils). All these occur as drugs in the medical texts proper.

Now these objects are not chosen at haphazard; they represent the materials introduced into the medical texts, either directly as healing remedies, such as onions, dates, palm blossoms and seeds, or they occur as accessories in medical treatment, such as bits of skin on which poultices and ointments were spread.[1] Similarly, in ritual texts,[2] detailing the ceremonies to be performed by the exorciser, a large number of actual medical compounds are introduced, consisting of such subtances as milk, butter (or cream), honey, wine, oil, meat, salt, dates, flour, and various trees, plants, herbs and stones, which enter as ingredients in the direct treatment of disease. Obviously, through experience it was found that in certain common diseases such as indigestion, diarrhœa, constipation, colds, headaches and fevers, certain articles of food and certain herbs, plants, seeds and juices, were beneficial. Primitive logic concluded that what was good for man must be bad for the demon, and accordingly the remedies were attached to the incantations as helpful accessories to the powerful formulæ, and symbolically introduced in the ritual accompanying the direct medical treatment of disease.

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[1] In the last tablet of the series, incantation formulæ, grouped around the tamarisk, the mashtakal plant, reeds, &c., are introduced—likewise taken from medical texts.

[2] *See* Zimmern, "Beiträge," &c., p. 98, Nos. 1-20, lines 32-54; No. 26, col. i, ii; Nos. 31-37, Stück I; 41-42, Stück I; 45, 50, 56-58, 66-67. Among the trees, plants, and herbs mentioned, which occur in the medical texts as ingredients of prescriptions, are cypress, cedar, tamarisk, liquorice, *shi-lim*-plant, *sikhlu* (a weed), *tul-lal*-plant, male *nam-tar* root, *kur-kur*, *mashtakal* herb, *khashkur* reed, *shumuttum*-plant; among stones, *shubū*, *shu-shar*, *an-gug-me*, *uknu* (lapis-lazuli), *kur-dib-ba*, *dushū*, &c. Various kinds of grain, corn and wheat and flour, made of these and other substances (see especially Nos. 41, 42, 25-43, *she-gud*, *she-shesh*, *enninu*, *she-gig*, *she-ash-a-an*, *tig-gal*, *tig-tur*, *tig-she-khar-ra*, *ku-a-ter*, &c.), also occur in medical prescriptions. As further evidence of the direct connexion of these ritual texts with medical treatment, and that they constitute the ritual to accompany medicinal treatment of disease, I may point (*a*) to such specific drugs as "Ninib" salve (Zimmern, *ibid.*, No. 26, col. ii, 7, which occurs in medical prescriptions—for example, "Cuneiform Texts from Babylonian Tablets, &c.," xxiii, Pl. 41, 11); (*b*) to the phrase *ba-lu pa-tan* (Zimmern, *ibid.*, No. 19, reverse, line 6), "without food," constantly introduced in medical texts to indicate that the mixture is to be taken fasting; (*c*) to the occurrence of the same technical terms—to wit, rubbing, mixing, wrapping, pouring, washing, spreading, &c., as in medical texts; (*d*) the invocation to the god Ninib and his consort Gula, the patrons of medicine (for example, Zimmern, *ibid.*, Nos. 1-20, 32, 40, and No. 25, 3); (*e*) wine libations (Zimmern, *ibid.*, No. 26, col. iii, 35, to iv, 11), corresponding to the consistent direction in the medical texts to take the prescribed remedies in wine; (*f*) frequent mention of oil, honey, milk, butter, &c.

This aspect of magic rites helps us to understand another phase of Babylonian-Assyrian medicine which will be illustrated by the examples that I shall place before you—namely, that by the side of really helpful remedies we find not infrequently concoctions and mixtures that are primarily nasty and ill-smelling. You are aware that right through the Middle Ages popular medicinal remedies included such materials as the dung and urine of man and animals, as well as all sorts of foul and decaying material—an elaborate *Dreckapotheke*, to use the expressive German term given to these substances by a scholar of the eighteenth century who made a compilation of them.[1] We can gather quite an extensive *Dreckapotheke* from the incantation and ritual texts, as well as from the medical texts proper. It is, I think, a fair conclusion that such remedies were originally applied to the demons in the hope of disgusting them by foul smells, to induce them to fly to surroundings where the air was purer, and the odours less disagreeable. The priests being quick to incorporate in religious practices the popular medical experience of the day thus rendered the bond between incantation rites and medical treatment indissoluble for all times. The independent development of medicine in Babylonia-Assyria was kept in check through the persistency of the alliance with sacred formulæ and with rites based on sympathetic magic.

Only one degree less important than the part played by incantation rites in the Babylonian-Assyrian medicine of all periods is the relationship between medicine and divination practices in the region of the Euphrates and the Tigris, where in the course of many centuries several elaborate systems of divination were produced, all aiming at the interpretation of signs that either involuntarily obtruded themselves or were sought out as a means of determining what the future had in store. Since everything came from the gods, this was equivalent to ascertaining what the gods intended by the sign sent or by the sign artificially obtained. Incantations were resorted to when the evil had come; divination was a means of forestalling the future, at least to the extent of being prepared for the impending blow. Incantations in their relation to medicine correspond to curative measures; divination was the unconscious forerunner of preventive medicine. To discuss the problem of divination here would take us far afield,[1] and I must content myself with indicating in the briefest possible manner the three chief systems of divination perfected in Babylonia-Assyria, each of which has a bearing on Babylonian-Assyrian medicine.

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[1] K. F. Paullini, "Heilsame Dreckapotheke," 1714 (reprinted Stuttgart, 1847.)

The first, and probably the oldest, of these methods was the endeavour to divine the future through the inspection of the liver of a sacrificial animal, based on the widespread notion among primitive people that the liver, as the bloody organ *par excellence*—blood being associated with life—was also the seat of the soul. The deity to whom an animal was offered identified himself with the victim. The soul of the god and the soul of the animal, as revealed through the liver, were considered to be in unison, like two watches regulated to keep the same time. You looked at the soul of the animal and thus procured an insight into the mind of the god. Before entering on any project—a military expedition, a journey, a business venture, a building operation, or what not—recourse was had to divination through the liver of a sheep, as the usual animal of a sacrifice. All peculiarities in the gall-bladder, in the lobes, in the various ducts, and in the markings on the liver due to the subsidiary bile-ducts, were noted, and partly on the basis of past experience when certain signs on a liver were followed by some favourable or unfavourable event, partly by an association of ideas with the nature of the signs,[2] conclusions were drawn as to the favourable or unfavourable disposition of the gods at the moment of inspection. Answers were thus secured to any question that might be asked, including inquiries

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[1] A summary of the chief divination methods devised by the Babylonians and Assyrians will be found in the author's monograph "Babylonian-Assyrian Birth-Omens and their Cultural Significance" (published as vol. xiv, No. 5, of Wünsch und Deubner's "Religionsgeschichtliche Versuche und Vorarbeiten," and in chap. iii of the author's "Aspects of Belief and Practice in Babylonia and Assyria," New York, 1911). A detailed treatment of Babylonian-Assyrian divination, with copious translations of omen texts of all kinds, was given by the author in his German work on the religion of Babylonia and Assyria ("Religion Babyloniens und Assyriens"), ii, pp. 23-415, liver-divination or hepatoscopy; pp. 415-748, astrology; pp. 749-775, oil and water divination; pp. 775-836, animal omens; pp. 836-946, birth-omens; pp. 946-969, summary of dream-omens and miscellaneous omens.

[2] Thus, if the gall-bladder was large or swollen, it pointed to extension of power; if small or shrunken, to decline and weakness. Similarly with other parts of the liver. A long gall-duct, e.g., was a good sign; a short one an unfavourable sign. A sign on the right side of the liver, or of a part of it, was applied to the king's side; a sign on the left to the enemy's side. If, e.g., the gall-bladder was tightly attached on the right side and loose on the left, it was a favourable sign for the enemy, who would hold the king and his army in a tight grasp; if, on the contrary, the left side was firmly attached, it meant that the enemy would be kept under control, &c., &c., *ad infinitum et nauseam*.

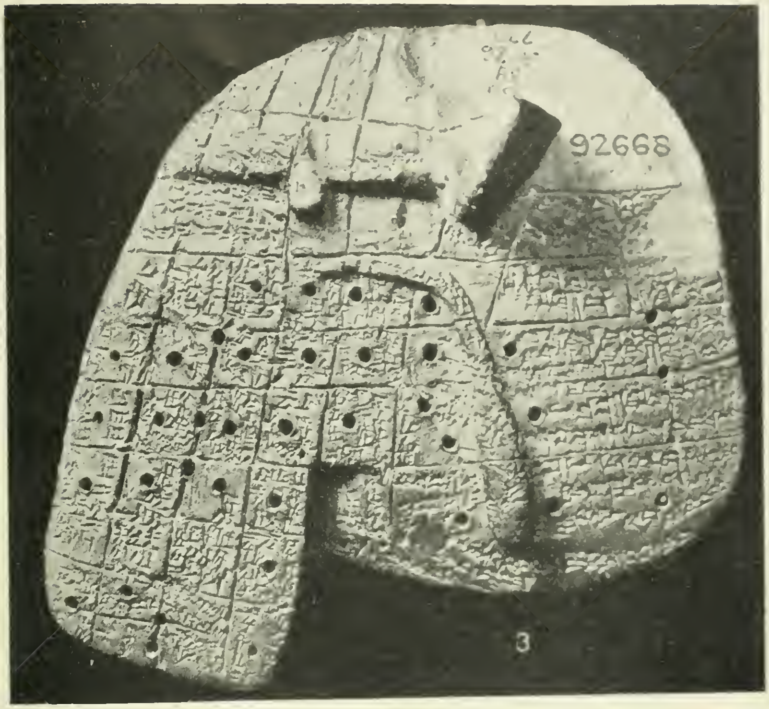

FIG. 2.

Clay model of sheep's liver (now in the British Museum) used as a model in a Babylonian temple school, for instruction in liver-divination. The accompanying inscription which fixes the date of the object at *circa* 2000 B.C. furnishes the prognostications for peculiarities noted at the parts of the liver indicated by the holes. The model is therefore a diagram to explain an omen text in which the peculiarities in question were registered together with the interpretation attached—an illustrative aid to show what portion of the liver was intended in each instance. It will be noted that the lobes of the liver, the *porta hepatis* (or depression separating the upper lobes from the lower ones), the gall-bladder, the gall-duct, the hepatic duct and the two appendices (the *processus pyramidalis* and *processus papillaris*) are distinctly shown, while the lines are intended somewhat conventionally to indicate the markings on the liver—due to the tracings on the surface of the liver of the subsidiary ducts that collect the bile from the liver into the main ducts. Technical names for all these and other parts and subdivisions of the liver were introduced by the Babylonian diviners, as well as rather fanciful designations for the markings on the liver, which were compared to weapons, to parts of the human body and so forth—thus extending the scope of hepatoscopy that finally led to an elaborate semi-mystical symbolism. The photograph and text are published in "Cuneiform Texts from Babylonian Tablets, &c., in the British Museum," part vi, Pl. 1-8.

as to the outcome of a disease with which someone was afflicted. Besides this direct bearing of hepatoscopy on one aspect of medicine, the practice of liver-divination led to the study of the liver, and it comes somewhat in the nature of a surprise to us to encounter in the extensive collections of liver omens, compiled by Babylonian-Assyrian priests, a detailed knowledge of the parts of the liver as well as an extensive anatomical terminology and a careful entry of all manner of pathological signs which, since liver diseases are common in tropical and sub-tropical regions, were frequently encountered in the organs of the sacrificial animals (*see* figs. 2, 3, 4, 5, 6). The study of animal anatomy and animal pathology thus received a direct stimulus from a practice that eventually degenerated into superstition—that is, a rite based on beliefs that had been outgrown.

Another system of divination that had an even more direct bearing on the study of the human frame in health and disease was the observation of signs noted in the case of infants and animals at the time of birth. The diviner—the native name for whom, *bârû*, defines him as an "inspector"—observed any striking traits in the case of the new life, any mark that would seem to be unusual or abnormal. The range of observation extends from large or small ears, eyes, head, mouth, nose, to real deformities and monstrous anomalies, such as children or animals with two or more heads, with an excess number of limbs, and the whole province of congenital defects and pathological malformations. The greater the abnormality the more significant the sign.[1] In the interpretation the same two principles that hold good for liver divination were followed—past experience and association of ideas. Thus an abnormally large organ of the body pointed to extension, to power, to success; an abnormally small one to weakness, disease and failure. By a further distinction, according as the sign appeared on the right side or the left, the possibility was afforded of specifying in whose favour the favourable sign pointed, or against whom the unfavourable sign was directed. The right was as usual your side, the left the other fellow's, which generally meant the enemy's side. What was favourable to you was unfavourable to your enemy, and vice versa.

Birth-omens also have their underlying principle. The observation of signs at the time of birth rests on the mysterious phenomenon of

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[1] *See* extract from the omen texts in the author's monograph "Babylonian-Assyrian Birth-Omens," &c., above (p. 118, note 1) referred to. Fig. 7 is a specimen of a birth-omen text.

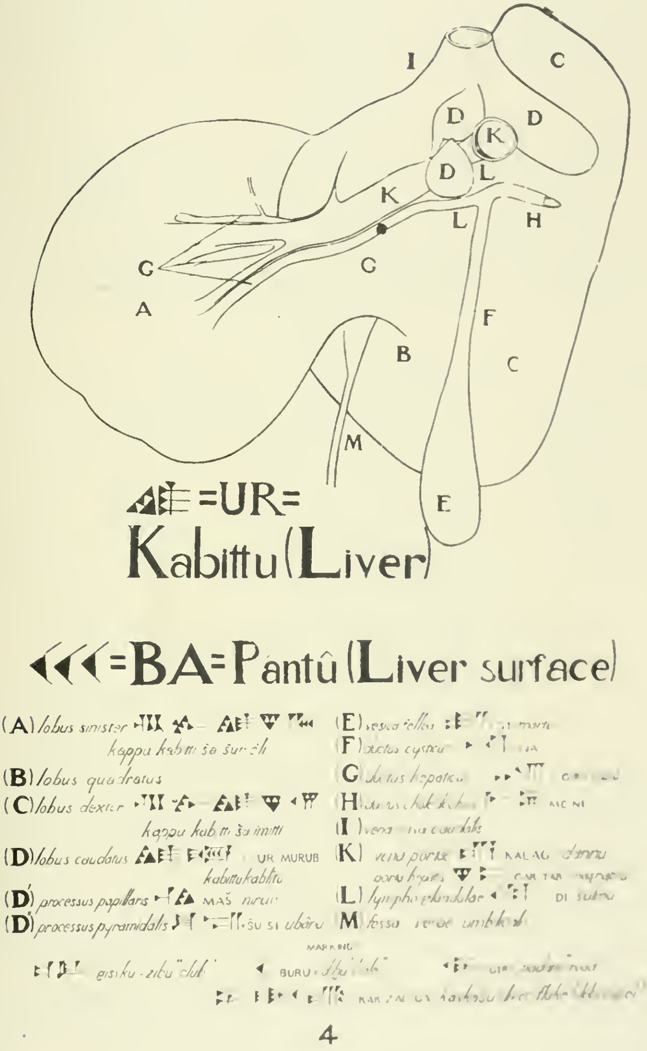
I
C
D
D
K
D
L
K
L
H
G
G
A
F
B
C
M
E
=UR=
Kabittu (Liver)
=BA=Pantû (Liver surface)
(A) lobus sinister kappu kabitti ša šumēli
(B) lobus quadratus
(C) lobus dexter kappu kabitti ša imitti
(D) lobus caudatus UR MURUB kabittu kabitu
(D′) processus papillaris MAŠ niru
(D″) processus pyramidalis ŠU SI ubânu
(E) vesica fellea
(F) ductus cysticus
(G) ductus hepaticus
(H) ductus choledochus
(I) vena cava caudalis
(K) vena portae KALAG danânu
(L) lymphoglandulae DI sulmu
(M) fossa venae umbilicalis
MARKING
gisiku-zibu
BURU
4

FIG. 3.

Drawing of a sheep's liver, with the Latin and Babylonian-Assyrian designations, in illustration of the anatomical nomenclature developed through hepatoscopy.

a new life issuing from another, and which made so profound an impression on primitive man. The time of birth, moreover, was a moment of transition, and as such was fraught with significance. The transition *motif* runs like a melody with many variations through the religious practices and popular customs of peoples everywhere. The chief popular rites—birth customs, puberty rites, marriage ceremonies and funeral rites—correspond to the four transition periods in the life of the individual.[1] Similarly, the chief festivals in every religion take place at transition periods—at the spring and autumn equinoxes, at the summer and winter solstices. The mystery of birth, marking the transition of the new life from its hiding-place, thus leads to the wide range of birth-omens illustrated by hundreds of texts in Ashurbanapal's library. A direct result of this system was to afford a stimulus to the study of anatomy and physiology, normal and abnormal; and this time not confined to animals. The birth-omen texts reveal an amazingly extensive anatomical and physiological nomenclature, covering every portion of the body and extending to minute differentiations.[2] Another by-product of birth-omens was the study of human physiognomy as a means of reading man's character and fate, and which, as I have endeavoured to show in a special monograph on birth-omens,[3] is to be traced back to Babylonian-Assyrian birth-omens, spreading to Greece and Rome and then to Central Europe, and maintaining its hold as a pseudo-science to the threshold of modern science.

Through liver divination, and more particularly through birth-omens, attention was thus directed to all kinds of peculiarities appearing in any part of the body and at any time, on the general principle that the unusual and the abnormal, while having special force at a period of transition, were always fraught with some significance; they pointed unmistakably to some unusual happening.

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[1] *See* the interesting study of such rites by Arnold van Gennep, who appropriately calls his work "Rites de Passage," Par., 1909.

[2] An admirable study of the Babylonian-Assyrian names of the parts of the body by Harri Holma, "Die Namen der Körperteile im Assyrisch-Babylonischen," Helsinki, 1911, *Annales Acad. Scient. Fennicæ*, Ser. B, vii, 1, shows how extensive the anatomical nomenclature grew to be in the course of time.

[3] "Babylonian-Assyrian Birth-Omens and their Cultural Significance," Giessen, 1913 (*see* above, p. 118, note 1). In this monograph I also endeavour to furnish the proof for the thesis that the ancient conception of monstrosities as "signs" (*monstra*) sent by the gods, foreshadowing coming disaster, rests on the significance attached to birth-omens, and that the fabulous hybrid creatures and monsters of mythology (fawns, satyrs, tritons, mermaids, cyclops, Cerberus, Pegasus, sphinxes, &c.) revert to the same source and represent the fanciful elaboration of anomalies observed in infants and in the young of animals.

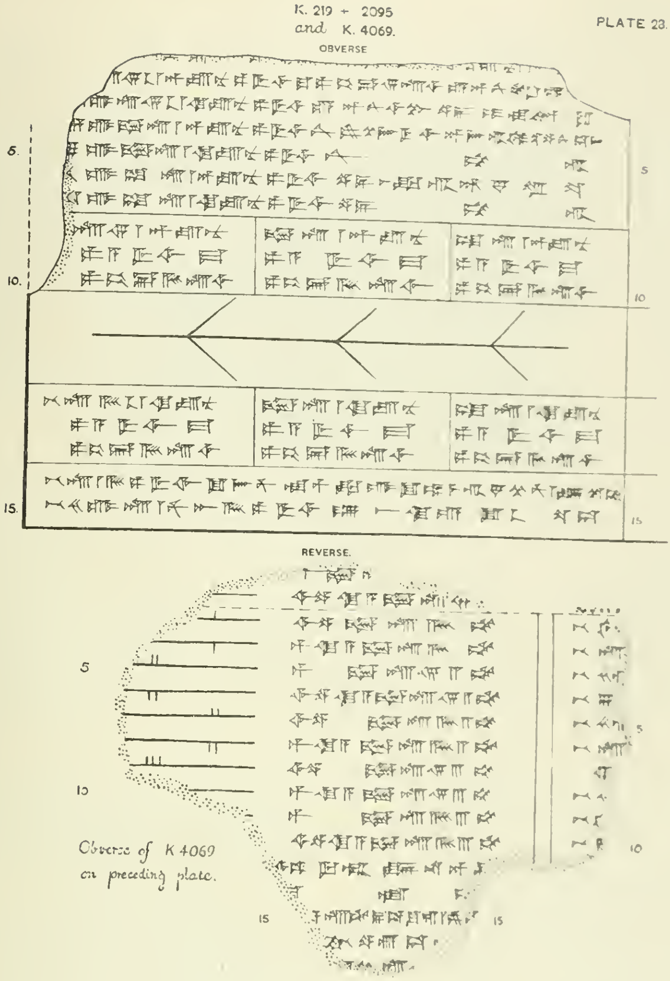

Fig. 4.

Diagrams to illustrate the signs on the liver referred to in the accompanying texts, which are to be regarded as handbooks of instruction and in the temple schools. In the upper portion, the long line appears to be intended for the hepatic duct and the branches to either side for the subsidiary ducts flowing into the hepatic duct. Above and below the diagram, explanations are added in the three sections separated from one another by dividing lines. The hepatic duct (as were other parts of the liver) was divided into three parts, known as the head, middle and base. The explanations above the diagram refer to the branch, i.e., to the subsidiary duct found at the head, at the middle, and at the base respectively; the three sections below the diagram refer similarly to the subsidiary ducts at the three divisions but lying on the other side of the hepatic duct, which is designated as the left side in contradistinction to the right side. The diviner holds the liver in his right hand with the part of the large finger-shaped appendix (*processus pyramidalis*) nearest to him. Above and below the three sections are a series of omens in which the interpretations for the appearance of branches or subsidiary ducts at the various intersections are added to the description of the signs.

The lower portion of the plate, showing the reverse of the tablet, is another diagram to illustrate divisions or notches on the hepatic duct, the accompanying explanation specifying a notch to the right above or below the duct, two notches to the left above and below, two notches to the right above and below, three notches to the left, above and below, &c. At the top of the reverse we may restore two lines, one showing a notch above the line at the left end, the other a notch below at the left. Similarly, at the bottom we may restore a line with three notches below the line, at the left end, another line with three notches above at the right end, a third with three notches below at the right end. The illustration is taken from "Cuneiform Texts from Babylonian Tablets, &c., in the British Museum," part xx, Pl. 28. The tablet belongs to the Kouyunjik collection—which is the designation of the texts forming part of Ashurbanapal's library. The text is probably a copy of a much older Babylonian original.

Included in the omen literature of Ashurbanapal's library are several elaborate series, all dealing with parts of the human body, grouped in a more or less systematic sequence, and concerned with the interpretation of peculiarities of diseases, or symptoms of diseases, connected with the head, the eyes, the neck, the spine, the limbs, and so on, through the entire human frame.[1] This subdivision of omen texts thus forms a supplement to the medical texts proper, though of importance chiefly because of the illustration that it affords of the association that continued in force between medicine and divination practices down to the latest periods.

The third system of divination was astrology, based on the principle that the movements in the heavens—the sun, moon, planets, and stars being identified with gods—represented the activity of divine beings preparing the events to take place on earth. Heaven and earth were the two scales of a perfectly adjusted balance. While the phenomena in the heavens were observed primarily with a view of determining what the gods proposed in connexion with the larger affairs of the country—the outlook for the crops, the outcome of a military expedition, and the general welfare of the country—astrology also was resorted to for the purpose of determining the course and outcome of a disease, according to the day of the month on which it began,[2] or according to phenomena observed in the moon or the planets at the time that the disease was raging.

While having less of a bearing on Babylonian-Assyrian medicine than the other two systems, astrology nevertheless enters as a factor which we encounter again in a much more extensive form in the case of the very late medicine of Syria.

The net result of the bearings of divination on medicine may be summed up in the statement that as a consequence of the persistent hold maintained by the belief in signs of all kinds, disease became

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[1] *See* Jastrow, "Religion Babyloniens und Assyriens," ii, p. 212, note 3, and p. 950 *et seq.*, for specimens of such texts in Boissier's "Documents Assyriens relatifs aux Présages," Par., 1894, pp. 20-26, 42, 97-99, 213-216, 244-247, 251-261; also "Cuneiform Texts," xxviii, Pl. 16 (K 9614), 18 (K 13959), 24 (82-3-23, 38), 25-29, 37 (79, 7-8, 89). *Cf.* Boissier's article on "Iatromantique, Physiognomonie et Palmomantique Babyloniennes," in the *Rev. d'Assyriologie*, viii, pp. 33-39. These specimens are from three elaborate series dealing with sickness omens.

[2] E.g., in the text, K 3962 (Boissier, "Documents Assyriens relatifs aux Présages," pp. 20-26). The series beginning "On the first day that he is taken sick" appears to have dealt in detail with this combination of medical omens and astrology. The frequent references in astrological texts to sickness and death in connexion with phenomena in the heavens on certain days further illustrate this association between medicine and astrology, which is maintained through the Middle Ages.

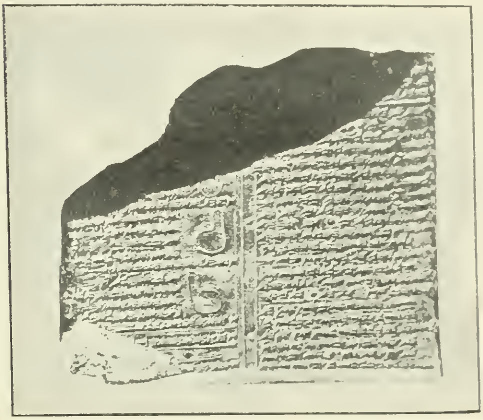
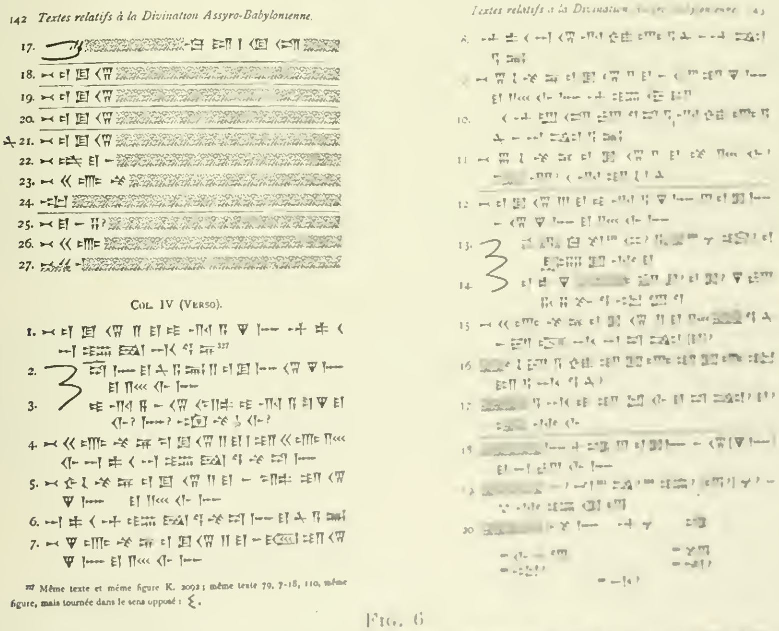


FIG. 5.

Photograph of the reverse of an omen tablet of Ashurbanapal's Library (K 1999), showing an illustration of the *processus pyramidalis* on a sheep's liver in different directions. The interpretations vary according to the shape and position of this part of the liver. This appendix, from its resemblance to a finger, was called the "finger" of the liver, while the Romans, who obtained their liver-divination from the Etruscans, called it the "head" of the liver (caput jecoris or jocinoris). Reproduced after Boissier, "Documents Assyriens relatifs aux Présages," Par., 1894.



142 *Textes relatifs à la Divination Assyro-Babylonienne.*

COL. IV (VERSO).

Même texte et même figure K. 2092; même texte 79, 7-18, 110, même figure, mais tournée dans le sens opposé :

Textes relatifs à la Divination [illegible]

FIG. 6

Photograph of the obverse of an omen tablet of Ashurbanapal's Library (K [illegible] 3-23, 26 + 83, 1-18, 421), with diagrams illustrating the various forms of [illegible] on the liver, spoken of as "weapons." According to the form of these "weapons" (two loops, three loops, "shaped like a head," &c.), the interpretation varied. Reproduced after Boissier's "Choix de Textes relatifs à la Divination Assyro-Babylonienne" (Geneva, 1905), pp. 142-143.

primarily an omen, the interpretation of which on the part of the priest as diviner supplemented the efforts of the priest as exorciser; while the priest as healer availed himself of both these aids to supplement his efforts in the direct treatment of the disease. These three aspects of Babylonian-Assyrian medicine — exorcism, divination, and medical treatment—blend together to form a composite picture in which it is not always possible to distinguish the different strains.

Before leaving this subject, let me call your attention to the wide spread of these systems of Babylon-Assyrian divination throughout the ancient world, primarily among the Greeks and Romans, but including also Egypt on the one hand and extending, as seems quite definite from certain indications, even to India and distant China on the other. The Greek and Roman inspection of the entrails involved primarily the observation of the liver, and at one time was exclusively confined to this organ. We have the direct proof for this in a remarkable bronze model of a liver found near Piacenza, containing an inscription in Etruscan characters (fig. 8). This bronze model forms a perfect parallel to the clay model of a liver found in Babylonia (fig. 2), and to a number of similar models unearthed a few years ago at Boghaz-Keui—an ancient Hittite centre in North-western Asia-Minor.[1] Connecting links, showing the spread of Babylonian-Assyrian liver divination across Asia Minor to Greece and Rome, have now been established beyond any reasonable doubt.[2] Similarly, with the interchange of ideas between Greece and the Orient following upon the conquests of Alexander, the system of Babylonian astrology was superimposed on Greek astronomy, which had hitherto been cultivated by the Greeks without any connexion with divination[3]; while, in return, the astronomical science of the Greeks made its way to Babylonia, and eventually brought about the decay of astrology in the country in which it had developed its greatest strength. The observation of birth-omens, similarly, passed through Asia Minor across to the West, and we find traces of this form

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[1] These models, of which there are a number in the Berlin Museum, are precisely of the same character as the one found in Babylonia, and are likewise covered with cuneiform inscriptions. The evidence is thus complete for the spread of Babylonian hepatoscopy at a period as early at least as 1500 B.C. across Asia Minor—the probable home of the Etruscans, who carried the method to Italy, while Greece may have received it directly through the migratory movements from Asia Minor across the Ægean Sea. Halliday, in his recent work on "Greek Divination," Lond., 1913, pp. 187-197, underestimates the bearings of the ascertained facts.

[2] *See* the author's paper "The Liver as the Seat of the Soul" in "Studies in the History of Religions presented to C. H. Toy," New York, 1912, pp. 143-168.

[3] *See*, for details, Jastrow, "Religion Babyloniens und Assyriens," ii, pp. 741-749, and chap. iv of the author's "Aspects of Belief and Practice in Babylonia and Assyria." Messrs. Boll and Bezold have recently furnished the evidence in a joint paper on "Reflexe astrologischer Keilinschriften bei griechischen Schriftstellern" (Heidelberg Akad. d. Wiss. Philos., histor. Klasse, 1911, No. 7) of the dependence of the astrological compilations of the Greeks upon the astrological omen texts of the Babylonians and Assyrians—extending at times to direct translation into Greek of data found in the cuneiform texts.

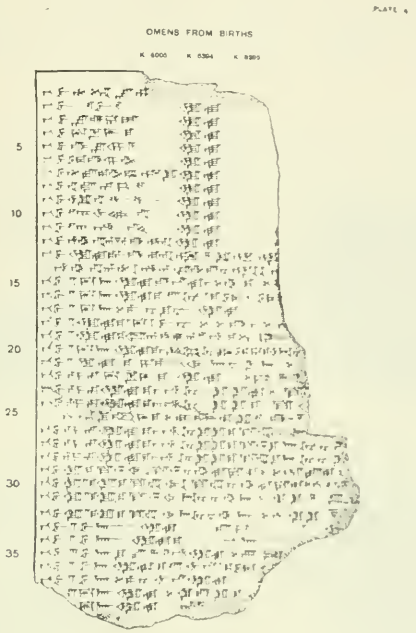
PLATE 4
OMENS FROM BIRTHS
K 4005
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FIG. 7.

A birth-omen text from Ashurbanapal's History (K 4005, &c.), specifying the interpretations for the case that a woman gives birth to an unshaped fœtus, to misshapen beings of various forms, &c. Other portions of the series to which this fragment belongs specify such cases as when a woman gives birth to a deaf-mute, to an idiot, to a child born with teeth, to a bearded child, to two fully formed boys, to a boy and a girl, to two girls, to a serpent—i.e., a child that suggests by its tiny head and body a serpent (Pliny, "Hist. Nat.," vii, sect. 3, and Julius Obsequens, "De Prodigiis," sect. 57, record the same "monstrous" birth of a serpent)—to a child with a lion's face—i.e., a large face and head suggesting a lion—with six fingers on the right or left hand, or six toes on the right or left foot, or six fingers (or toes) on both hands (or feet), &c. There are hundreds of such texts in the Kouyunjik collection, detailing all kinds of abnormalities and monstrosities, possible and impossible, with interpretations attached. The plate is reproduced from "Cuneiform Texts from Babylonian Tablets, &c., in the British Museum," part xxvii, Pl. 4.

of divination in the widespread belief in monsters, which, as the name clearly indicates, were originally regarded as signs (*monstra*) at the time of the birth of an infant or an animal.[1]

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[1] *See* the author's monograph on "Babylonian-Assyrian Birth Omens," &c., above referred to, and a paper on "Babylonian, Etruscan, and Chinese Divination," published in abstract in the "Actes du IVe Congrès International d'Histoire des Religions," pp. 108-111.

We need not be surprised to find that Babylonian-Assyrian civilization should have left its traces so prominently in the spread of divination practices. It frequently happens that the by-products of a civilization (like the "evil that men do [which] lives after them") proves more attractive, and exerts a more potent influence than the better achievements which, as the expression of a people's peculiar genius, are not so readily transferred from one ethnic group to the

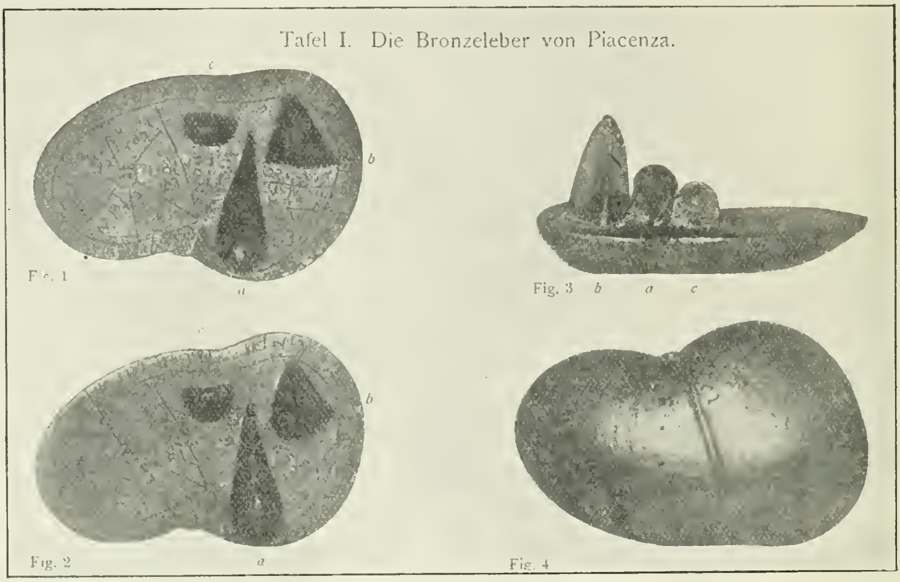

Fig. 8.

Bronze model of a sheep's liver found in 1877 near Piacenza and now in the Museo Civico of Piacenza. The model forming a parallel to the clay model from Babylonia (fig. 2) shows the same parts of the liver clearly marked, though somewhat more conventionally executed. It dates from about the third century B.C. and was used in the Etruscan schools of augury as an object-lesson for instruction in hepatoscopy, precisely as was the Babylonian counterpart. Like the latter, it is covered with inscriptions to elucidate the significance attached to signs noted in the various subdivisions of the liver. The lines diverging from the small circle on the left lobe of the liver correspond to the intersecting lines drawn on the Babylonian model—intended perhaps to indicate conventionally the traces of the subsidiary ducts or the markings on the liver. An entirely satisfactory interpretation of the Etruscan inscription which contains the names of deities must be postponed till scholars shall have found a definite key to Etruscan, but it would appear that the Etruscans went beyond the Babylonians in attaching to liver-divination an elaborate symbolism, which rested on a supposed correspondence between the parts of the liver and the heavenly bodies—the liver as a microcosm reflecting the macrocosm. For further details see the author's work "Aspects of Belief and Practice in Babylonia and Assyria," New York, 1911, chap. iii, and the author's "Bildermappe zur Religion Babyloniens und Assyriens," Giessen, 1912, No. 104, and the literature there referred to.

other. The example of Greek art did not produce an artistic movement of equal significance in Rome, despite all that Rome took over from the Greeks. The philosophical systems of India, profound and impressive, were not adapted to the Western mind, and therefore did not pass beyond the bounds in which these systems arose. The teachings of the Hebrew prophets lay neglected for centuries, and the attitude towards life among the Western nations had to undergo a complete transformation before, under the sway of Christianity, they became the basis of modern civilization. So it happened that the more obvious legacies of the Babylonian civilization were a superstition—hepatoscopy—and two pseudo-sciences—astrology, and the determination of the fate of individuals through the study of their facial features.

IV.

The medical texts in Ashurbanapal's library, to which we are now prepared to turn,[1] reveal in their phraseology the attachment to the two sources whence they are derived—incantations and divination practices. Each section begins precisely in the style of the omen texts with a sign to be read *enuma*, signifying "When." The formula reads: "When a man has this or that symptom," or "when he has this or that disease," just as the omen texts of all classes begin with, "When so-and-so is the case," "When the liver shows such and such signs," "When the moon or sun or a planet presents such and such phenomena," "When a child, or a sheep or some other animal, is born with such and such marks," "When the head, neck, arms, and so forth of a human being present such and such peculiarities," and so forth. Corresponding to the interpretation of the omen, we have in the medical texts the directions as to what is to be done. "*Ana balaṭishu*," "for the man's life." The terms used to indicate that someone is troubled with a disease are similarly derived from the incantation *motif*—namely, "eating" and "seizing." Pain is when a man's head, stomach, bowels, liver, or any other portion is being eaten, or, more precisely, that someone is "eating" a part of the body. The expression finds its natural explanation as a transfer to medical diagnosis of the belief that a demon is gnawing at some part of a man's body. The other term "seizing," as, e.g., that a man is "seized" with a fever, a headache, or the like, as we also say, is similarly derived from the theory that a demon has taken hold of a man's head, stomach, breast, and so forth.

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[1] Up to the present time we have had two publications of medical texts from the Kouyunjik collection: (1) Küchler's "Beiträge zur Kenntniss der Assyrisch-Babylonischen Medizin," Leipz., 1904, and (2) "Cuneiform Tablets from Babylonian Tablets, &c., in the British Museum," part xxiii (London, 1906), containing Pl. 23-50, medical remedies accompanied by incantations and magic rites, and Pl. 1-22, incantations and magic rites for exorcising the demons of disease with medicinal mixtures introduced as accessories. On these two classes of medical texts see further below. In the *Zeits. f. Assyriologie*, xix, pp. 175-181, C. Fossey has also published an interesting medical text from Ashurbanapal's library, containing remedies against poisonous bites. The credit of having been the first to call attention to the medical texts in Ashurbanapal's library belongs to Professor Sayce, who published portions of several texts in the *Zeits. f. Keilschriftforschung*, i, pp. 1-14 and 205-216, under the title of "An Ancient Babylonian Work on Medicine." Naturally Sayce's first attempts at translating these texts have now been superseded. A survey of the literature on Babylonian-Assyrian medicine, arranged chronologically and brought down to 1902, will be found in von Oefele's monograph "Keilschriftmedizin, Einleitendes zur Medizin der Kouyunjik-Collection" (Abhandlungen zur Geschichte der Medizin ed. Magnus, Neuburger and Sudhoff, Heft iii), Breslau, 1902. Freiherr von Oefele has published a large number of papers on special points on Babylonian-Assyrian medicine, scattered throughout medical journals (*see* the list in his monograph, pp. 8-15, supplemented by Budge, "The Syriac Book of Medicines," i, p. cl, note 1), but while the papers contain many interesting suggestions, and von Oefele's researches, extending over many years, have contributed to our knowledge of Babylonian-Assyrian medicine, many of his deductions are based on insufficient proofs, and he is too strongly inclined to speculations which are not justified by the texts themselves. This applies particularly to his monograph on "Keilschriftmedizin in Parallelen" ("Der Alte Orient," iv, 2), which gives a distorted view of Babylonian-Assyrian medicine and indulges in phantastic theorizing, which is unfortunately introduced also in von Oefele's sections on the subject in Neuburger and Pagel's "Handbuch der Geschichte der Medizin," i, pp. 19-74 and 94-101 (English translation with an introduction by Sir Wm. Osler in course of publication). The entire chapter is sadly in need of a thorough revision in order to bring it up to the standard of our present *real* knowledge of the subject, based on a detailed study of the texts at first hand.

Interspersed with the remedies are incantations and magic rites, and we are constantly surprised at finding in connexion with prescriptions of medicinal potions, or mixtures, such directions as that the patient should put a hair taken from an old woman's pudenda into his mouth; or that he should take hairs from the tail or other parts of the body of a male or of an unmounted female kid with certain medicinal plants, or that he should swallow the mixture while holding it in his left hand, and drink it to the accompaniment of an incantation. Lastly, the texts themselves are compilations from various sources, such as are the collections of omens. In both instances the aim of the compilers is to gather the experience of the past. Corresponding to the various interpretations registered for the same omen, we have in the medical texts the description of the physical ailment, followed by a larger or smaller series of variant remedies. It was the business of the physician to select in each case one which, in his judgment, would be the most likely to bring about results; or he would try them all in some order of succession in the hope of finding one to fit the case.

Now, while there are many hundreds of medical texts that still lie unpublished in the British Museum, though there is now a prospect of more being placed at the disposal of scholars,[1] it is, I think, perfectly safe to say that the general principles of medical treatment and the general character of the remedies applied as resulting from the material already at our disposal will not be essentially affected. Progress will be rather in the direction of identifying the substances used as drugs. This problem constitutes at present the most formidable obstacle to a complete understanding of the medical texts. We may distinguish two classes of these medical texts—those in which incantations play a secondary part, regarded together with magic rites as accessories to the treatment, and those in which incantations and magic rites are quite as prominent as, and indeed overshadow, the treatment.[2] I am inclined to regard the latter as considerably older than the former, and it will, I think, be regarded as natural to find in later texts the medical aspects more largely emphasized, and the incantation element reduced in proportion.

We have not as yet discovered in the medical literature of Babylonia-Assyria any compilation corresponding to such extensive and systematic hand-books like the Papyrus Ebers, or the Berlin or Hearst papyri in Egyptian medical literature, though it is quite likely that such complete compilations existed. We have, however, portions of a number of series, each one of which covered several tablets and that dealt with a variety of diseases.

One of these series,[3] known from the opening words as "When a man has a cold," &c., deals, so far as we can see from the portions published, with a variety of troubles having their seat in the stomach, in the intestines, and in the liver. The tablet begins with the diagnosis of a cold which has settled in the stomach: "If a man is sick of a cold,[1] which has turned into stomach pains, let him compound "pestilence" root, liquorice root,[2] Tar-mush[3] plant" (perhaps the bean) "Shi-lim (darnel)"[4] Shi-man, Tu-me and "tongue" plants — these seven drugs placed in wine let him drink, as the star rises[5] (i.e., at night) and in the morning without food and he will recover."

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[1] Mr. R. C. Thompson, who copied the texts in "Cuneiform Texts," part xxiii, and who has published studies on them in the *Proceedings of the Society of Biblical Archæology*, 1908, xxx, pp. 63-69 and 245-251, and in the *American Journal of Semitic Languages and Literature*, xxiv, pp. 1-6 and 323-353, has in preparation the publication of over 500 additional medical tablets or fragments from the great collection in the British Museum

[2] *See* above, p. 111, note 1.

[3] Tablets I-III of the series, so far as preserved, have been published by Kuchler in the work above (p. 129, note 1) referred to. Other portions of the series are represented by Kk. 2433, 2140, and 3516, according to indications in Bezold's "Catalogue of the Cuneiform Tablets in the Konyunjik Collection." The titles of what would correspond to modern books are in Babylonian-Assyrian literature chosen from the opening words of the first tablet of the series. An interesting survival of this custom is the designation of Papal Bulls from the opening words.

Passing by the identification of the enumerated plants for the present, it will be seen that we have here a simple prescription directing the physician to prepare a mixture of drugs made from roots and plants to be taken as a potion in the morning and evening without food, or, as we would say, "fasting," or before his meals. There is nothing to suggest any connexion with the magic ritual. In the next paragraph, however, directions for a magic rite accompanied by an incantation are set forth. The one who has stomach pains is to be taken during his illness on a boat, and a series of incantations, technically known as "house of light," are to be pronounced over him, and, it is added—precisely as in the case of the potion—"he will recover." There follow a series of variant directions for the same troubles, which will illustrate one of the leading principles of these tests—namely, to put together on the basis of past experience as many remedies as possible. No differentiation appears to be made as to the stage of the disease at which the one or the other remedy is to be administered. On the other hand, the enumeration reveals some interesting methods of procedure.

> "If the same is the case" (indicated by the repetition sign) "he should suck the white meat of a swine without food and he will recover.
>
> "If *ditto*, let him take liquorice root in water without food and he will recover.

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[1] *Su'alu*, which Küchler (p. 65), though hesitatingly, compares with the Arabic *su'al*, "cough," but which I think is used in a larger sense, like the current use of our "cold." The word is of frequent occurrence in both medical and incantation texts—e.g., Shurpu series, Tablet VII, 21-26, in a group with other diseases; also "Cuneiform Texts," xiv, Pl. 31 (D.T. 136), 7-13, in a fragment of a three-column list of drugs with the diseases for which they are to be used, and indications of how they are to be taken.

[2] *Shushi*, identified by Küchler (p. 66) with Aramaic *shûshâ*, glycyrrhiza (Löw, "Aramäische Pflanzennamen," p. 378), largely found in Babylonia.

[3] I venture to compare this with Talmudic, Arabic, and Syriac *turmûsa* or *tirmîs*, "lupinus" (Löw, *ibid.*, p. 394).

[4] *Shi-lim* (a better reading than shi-shi) suggests a comparison with the Arabic *shilam*, "Lolium," either a weed growing among wheat or a degenerate wheat (*see* Löw, *ibid.*, p. 133).

[5] Lit., "before the approach of a star," used constantly in the medical texts as a standing phrase to indicate the approach of night. Not infrequently the phrase appears in fuller form, "before the approach of the goat-fish constellation," which, perhaps because this constellation or some of its stars were visible for the greater part of the year, became a generic term for the approach of night. A variant phrase is "before the approach of Gula," see below, p. 152.

"If *ditto*, let him compound salt with water and drink it without food and he will recover.

"If *ditto*, let him mix *Amanu*[1] salt without food and he will recover. If a man has stomach pain let that man sit on his feet and have boiling juice of sikruti cassia[2] poured over him and he will recover.

"If *ditto*, let him kneel on his feet and let cold water flow over his head and he will recover.

"If *ditto*, place his head downwards and his feet up, strike his cheek forcibly, rub him violently, say to his stomach 'Be good'; with the left thumb manipulate his buttocks fourteen times, manipulate his head fourteen times, and roll him on the ground.

"If *ditto*, mix *male* pestilence root,[3] liquorice root, darnel (?), *Shi-man* plant, bean (?), *Mashtakal*-plant and *Cynoglosson*[4] and either in water [or wine] let him drink it."

These eight remedies furnish a good bird's-eye view of the scope of Babylonian-Assyrian medicine. The use of liquorice root and of salts in stomach disorders will be admitted to be rational. Swine's flesh plays a prominent part in magic rites, and therefore raises a suspicion that this remedy is symbolical rather than therapeutic, to coax the demon out rather than to help the patient. The reference to the kneeling position in order to relieve the tension of the muscles of the abdomen is exceedingly interesting, and so is the endeavour to stimulate the blood circulation by pouring hot or cold water over the patient, though the procedure seems somewhat violent. Still more drastic, and yet having a rational basis, is the effort to produce an equable circulation of the blood by placing the head of the patient low and the feet high, and by administering what was evidently a form of massage manipulation. Will it be regarded as too fanciful if I suggest that the direction to encourage the stomach to accept the violent treatment by telling it "to be good" is to be explained as psychical—the natural impulse to accompany the physical exertion on the part of the physician by emitting some sounds?

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[1] "Salt of Amanu," occurring frequently in medical texts, and mentioned also in a list of salts ("Cuneiform Texts," xiv, Pl. 31, K 14053, line 11, perhaps also 1, 2). This is evidently identical with our sal ammoniac, which is commonly supposed to be of Egyptian origin—obtained from a temple of the god Ammon. Amanu is the name given in cuneiform literature to the anti-Lebanon range, and it is therefore much more plausible to assume that the salt was obtained from that district. It may have been imported into Egypt and the term there confused by popular etymology with Ammon.

[2] *Kasû*, designated as a "green" plant or herb, is one of the most common substances named in medical texts and in lists of drugs. The juice is in almost all cases specified to be mixed with other drugs or to be boiled in water or wine. In "Cuneiform Texts," xiv, Pl. 22, col. viii, 51, *kasû* is enumerated among "sappy" herbs. The identification with cassia (cinnamomum zeylanicum), which was first suggested by Talqvist, is no doubt correct. (*See* Löw, "Aramäische Pflanzennamen," p. 348 *et seq.*) Several varieties were known, and one of these, designated as *sikruti*, is specified in our passage. The foreign origin of the Greek term "kassia," has always been recognized, and it is a great gain to be now able to trace it to its source. *See* also Holma, "Beiträge zum assyrischen Lexikon," p. 82 *et seq.*

[3] The "male" and "female" of substances are often specified in the medical texts as also in lists of plants. According to "Cuneiform Texts," xiv, Pl. 23 (K 259), line 1, male "pestilence" root is to be used also as a salve for a sore mouth. It is evidently some pungent weed capable of drawing out inflammation.

[4] Another substance that can now be definitely traced back to Babylonian medicine where it is known as *lishan kalbi*, "dog's tongue," of which Cynoglosson (*Plantago* [illegible]) is the literal translation. The term has also passed into Syriac and Arabic. (*See* Löw, [illegible], p. [illegible].) Several varieties of Cynoglosson were distinguished by the Babylonians, as is shown by such lists as "Cuneiform Texts," xiv, Pl. 20, 13-19.

Lastly, let me call your attention to the alternative to take the medicine in water or in wine. In most cases light wine, rather than water, is prescribed, evidently for the purpose of making the potion more palatable, precisely as physicians nowadays add some substance agreeable to the taste.

By way of contrast let me now take up a short specimen from the second class of medical texts, in which magic rites and incantation formulæ predominate. It is only proper to add that the translation of these texts offers considerable difficulties, because they are written so largely in ideographic form where the signs stand for entire words, and one is often in doubt as to the precise meaning of the word intended. A tablet belonging to a series for the cure of pain in the muscles or the joints[1] begins with a case of rheumatism settling in the lower extremities. The following directions are prescribed[2]:—

> "Encircle water, taken from the Euphrates[3] with flour of rotten grain,[4] place [within] the circle a *Sha-Shur* reed. Take a measure[5] of grain, place it on the Sha-Shur reed and let the sick man sit [on it]. Fill a Ka measure with rotten grain and put it on the Sha-Shur reed and place the foot of the sick man on it, and cover the foot with a putrid dough[6] made of the rotten grain."

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[1] Portions of three tablets of the series are published in "Cuneiform Texts from Babylonian Tablets, &c., in the British Museum," part xxiii, Pl. 1-14.

[2] Pl. 1, lines 2-4.

[3] Reed *sa-kha-an*, like "Cuneiform Texts," xxiv, Pl. 8, 11, and Rawlinson, ii, Pl. 35, 6^c, which there appears as a designation of the Euphrates.

[4] Ku, the general designation for "flour" made of any substance, followed by the sign *she* = grain, and *shesh* = *marru*, "bitter," (Brünnow, "Classified List," No. 6442; Meissner, "Seltene Assyrische Ideogramme," Nos. 4582-83), or *limnu*, "bad" (Meissner, *ibid.*, No. 4581). Evidently spoiled grain is intended.

[5] On Gish-Bar as a measure, *see* Hazuka, "Beiträge zu den Altbabylonischen Rechtsurkunden," p. 11.

[6] Gar-Lag-Mal, to be read *lû* (Meissner, *ibid.*, No. 9309), is food that causes discomfort or oppression (cf. Muss-Arnolt, "Assyrian Dictionary," p. 464b), and is so described in incantation texts.

There is apparently described here a poultice of water and grain, on which the patient is to sit and which is also to be placed on his foot. This might, to be sure, be regarded as a primitive method of easing the pain, but the manner in which the directions are given reveal the magic character of the rite and are precisely of the same order that we encounter in pure incantation texts, where great stress is laid on obtaining water from a sacred stream (such as the Euphrates was) and on using ill-smelling foods. The method of surrounding the water with an embankment of grain is likewise indicative of a symbolical rite. The emphasis placed upon the quality of the corn as bad or rotten, and that the poultice is designated as putrid food, leave no doubt that the purpose of the mixture is to disgust the demon. In keeping with this interpretation of the ceremony there immediately follows an incantation to be recited, containing the usual gibberish and ending with the hope, "May so and so, the son of so and so live—recite the incantation." As a third feature, an exorcising ceremony is prescribed in connexion with the preparations and incantation rite.[1]

> "Recite this incantation while covering the thigh. Place the putrid food in a room facing the west. Close up the door with earth taken from a *Pu*-plant, seal the door with *Shubu* and *ginnu* stones.[2]
>
> "Then fasten a torch to the man's thigh, take hold of his hand, and let him pass seven times and again seven times across the encircled water, taken from the Euphrates. When he has crossed it, recite in a clear voice the incantation 'Ea has made, Ea has loosened. Remove the evil, ease the pain (?). Undo the evil knot, Ea be with thee!' "

In order to understand this ceremony we must bear in mind that Ea is the god of the water in general, the main seat of whose cult was at Eridu, at the head of the Persian Gulf. He is the god of humanity, who steps in to relieve man from all kinds of troubles, and through whose element—water—the sick man, in the oldest incantation rituals, is cleansed of disease.[1] Ea is also the creator, the one who made man, as well as the water. The passing of the sick man across the water symbolizes, therefore, the release of the sufferer, to be secured through water as the element of the god; while the imprisonment of the poultice in a compartment tightly closed and sealed with earth and sacred stones is to place the demon, who is supposed to have issued out of the body into the poultice, beyond the range of further harm. The association of ideas is of the same order as that implied in a magic ritual described in Leviticus xiv, 1-8, where the demon of the disease,[2] a form of psoriasis, as described in the thirteenth chapter, is transferred to a bird, and the bird bearing the disease let loose. We are fortunate in having a number of pictorial representations of the exorcising of demons of disease in ancient Babylonia and Assyria (fig. 9).

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[1] Lines 9-14.

[2] Stones are frequently introduced among the remedies in medical texts, though in many cases the determinative for "stone" is merely an indication, as I am led to believe, after a prolonged study of medical and incantation texts, that the substance is inorganic as against organic substances which are introduced by the sign for "plant." "Plant" and "stone" are thus used in a large conventionalized sense for the two main subdivisions of drugs. See further on this point below, pp. 153-154. The use of stones in medicine takes its rise from the views associated with stones as amulets, supplemented by the medicinal qualities that the powder of certain crushed stones was found to possess.

As a third example in illustration of the general character of medical tests, I choose one which the College of Physicians in Philadelphia acquired about a year ago, and which it is my privilege, with the kind permission of the authorities of the Philadelphia institution, to bring before you for the first time. Its special interest lies in the fact that it does not form part of the Nineveh library, but represents a private possession of an Assyrian official who, to judge from the style of the written characters, lived in the seventh century B.C. The name of the owner is given at the close of the tablet, which turns out to be an extract from a large series, covering at least five tablets, and of which portions have been published by the British Museum authorities.[3] By means of a comparison with this publication I have succeeded in restoring the defective portion of the obverse, and in reading most of the badly weathered reverse.[4] The writer evidently extracted for his own private purposes—presumably for his medical practice—such of the directions from the large handbook as seemed efficacious to him. The

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[1] By the side of water, fire, being also a sacred element, is prominent in incantation texts as a means of cleansing the sufferer from the disease which has rendered him, as it were, unclean. Hence, by the side of Ea, the fire god Nusku plays an important rôle. Both the *Shurpû* and the *Maklû* incantations series are full of appeals to those two gods.

[2] Known as *sara'ath*, ordinarily rendered leprosy, because of the use of the term *lepra* in the Greek translation, but the Greek *lepra* is not leprosy. See an analysis of Leviticus xiii and xiv, by the writer in the *Jewish Quarterly Review*, iv, No 3.

[3] "Cuneiform Texts," &c., xxiii, Pl. 23-50.

[4] The tablet will be published in full by me with a translation and commentary in the *Transactions of the College of Physicians of Philadelphia*. *See* figs. 10*a* and 10*b*, showing obverse and reverse of the tablet.

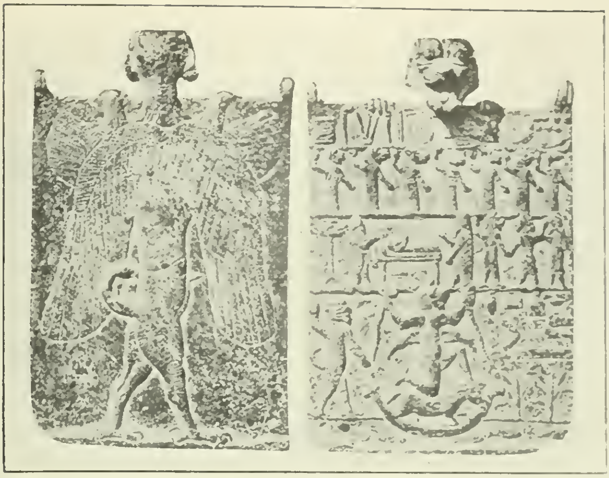

Fig. 9.

Bronze tablet with an illustration of an exorcising ceremony. The one side of the tablet shows a demon standing upright and gazing at the scene depicted on the other side. This scene is divided into five sections. The first section contains the symbols and emblems of the great gods—such as appear on Babylonian boundary stones, where, instead of pictures of the gods, their emblems are depicted to symbolize the protection of the land rights described in the inscriptions on the stones. See many examples in L. W. King's valuable work, "Babylonian Boundary Stones and Memorial Tablets in the British Museum," Lond., 1912. The symbols here depicted from left to right are: (1) Shrine with tiara, the symbol of Anu, the supreme god of Heaven; (2) mace with ram's head, the symbol of Ea, the god of waters and the protector of humanity; (3) lightning-fork, the symbol of Adad (or Ramman), the god of storms and thunder; (4) spear-head, the symbol of Marduk, the patron deity of the city of Babylon and the head of the Babylonian Empire after the union of the Euphrates States, *circa* 2000 B.C., with Babylon as the capital; (5) the double staff (or wedge), the symbol of Nebo, the god of wisdom and of writing; (6) eight-pointed star, the symbol of the goddess Ishtar, identified with the planet Venus; (7) the sun-disk, the symbol of Shamash, the sun-god; (8) the moon-crescent, the symbol of Sin, the moon-god; (9) seven circles, the symbol of Sibitti, the "seven-god," symbolizing, perhaps, the large group of minor deities, seven being chosen as a large and sacred number.

The second division depicts seven demons of disease, often mentioned in incantation texts, and who are described as cruel in aspect and merciless of nature, lying in wait for their victims, striking them unawares, and relentless in their grasp. Each of the demons came in turn to specify some particular disease, so that the group might be called a Faculty of Medical Demons.

The third division shows a sick man with upraised hands lying on a couch, at either end of which stands an exorciser clad in fish-robes as priests of the water god Ea. The exorcising ceremony is carried out in the name of Ea, who is likewise depicted as a human figure with a fish-skin hanging down his back. The exorciser, as the priest of Ea, clothes himself in the robes of the god as a means of securing the powers of the deity whom he vicariously represents. Behind the one exorciser stands a table with a vessel in which, presumably, some mixture has been compounded to be used in driving the demons out of the body. Behind the other exorciser the demons are depicted as being driven out; they are leaving the patient, who is thus released of his pain and sufferings. The exorcisers are performing some magic rite; the one at the left end is apparently sprinkling the patient with the remedy.

In the fourth section two other demons are depicted; in the centre Labartu, the demon who threatens the life of the lying-in mother and the newborn babe. She is given a particularly horrible aspect, holding a serpent in each hand with swines sucking at her breasts. She kneels on an ass, who is standing in a boat—the scene symbolizing again the departure of this demon, who is perhaps being driven off by the demon to the left. To the right of Labartu various kinds of vessels and jars and other objects are depicted—used in connexion with the medico-magical rites to accompany the incantation formulæ.

In the lowest section the water is represented by swimming fish, with trees growing on the river bank. No fewer than five specimens of such tablets in bronze or stone, scattered in various museums, are now known, an indication of the wide use of such designs as amulets. The one here reproduced is in the *de Clercq* collection in Paris and was first described by Clément-Ganneau (see *Revue Archéologique*, Nouvelle Série, 1879, xxxviii, pp. 337-349) who, however, regarded the scene as an illustration of the nether world. The correct explanation was given by Frank in a monograph, "Babylonische Beschwörungsreliefs," Leipz., 1908, who describes and discusses in detail the other specimens of this scene. See further, Jastrow, "Bildermappe," &c., No. 100

extract is from the first three tablets of the series[1] which dealt with various forms of fever and headaches. The word for fever is "fire," which has an interesting parallel in the Babylonian Talmud—the great ritualistic compilation of the Jews, which, by the way, is full of ancient medical lore, where the question is asked,[2] "What is fever?" to which a Rabbi replies, "A fire of the bones," the same expression, therefore, that is used in Babylonian-Assyrian medical texts. The tablet begins:—

> "If a fever seizes a man, localized in the nerves of the forehead, and it affects his eyes, so that his vision is clouded . . . and he is afflicted with an acute inflammation, and his eyes water, pound one-third of a Ka of powdered *sikhlu*[3] with Khaldappan stone, take one-third of a measure of it for the head that pains; knead with cassia juice, wrap it around [the head], attach it [by means of a bandage], and for three days do not remove."

The remedy consists, as you see, of a compress to be applied to the head, containing some substances to draw out the inflammation, or perhaps to produce a counter-irritation. A number of variant remedies of a similar character follow, including what is particularly valuable, a wash of a certain kind of alkali. "Wash his eyes," the

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[1] The obverse is an extract from the first tablet of the series.
Lines 1-6 correspond to "Cuneiform Texts," xxiii, Pl. 23, 1-5 (with some variants).
Line 7 corresponds perhaps to Pl. 24, 18.
,, 8 ,, to Pl. 24, 21.
Lines 9-17 correspond ,, Pl. 26, 4-9.
,, 18-20 ,, ,, Pl. 32, 8-9.
,, 21-26 ,, ,, Pl. 33, 10-13.
,, 27-30 ,, ,, Pl. 34, 29-31.
,, 31-45 ,, ,, missing portions of the first tablet of the series.
The reverse is from the second and third tablets of the series.
Lines 1-3 correspond to Pl. 40, 19-22 (?).
,, 4-7 ,, ,, Pl. 39, 7-9.
Line 8 corresponds ,, Pl. 40, 25.
Lines 9-12 correspond ,, Pl. 42, 16-19.
,, 13-15 ,, ,, Pl. 41, col. ii, 2-3.
,, 16-18 ,, ,, Pl. 42, 8-9.
,, 19-27 ,, ,, Pl. 45, 1-13.
Line 28 missing in "Cuneiform Texts," xxiii.
Lines 29-33 correspond to Pl. 49, 1-5 (third tablet).
,, 34-39 correspond to the obverse of K 4023 (third tablet) (unpublished), col. i, lines 1-6.

[2] Talmud Babli, Berakoth, fol. 32a. In the New Testament, fever is several times referred to—e.g., Matthew viii, 14 (= Mark i, 30 = Luke iv, 38); John iv, 52.

[3] A kind of weed.

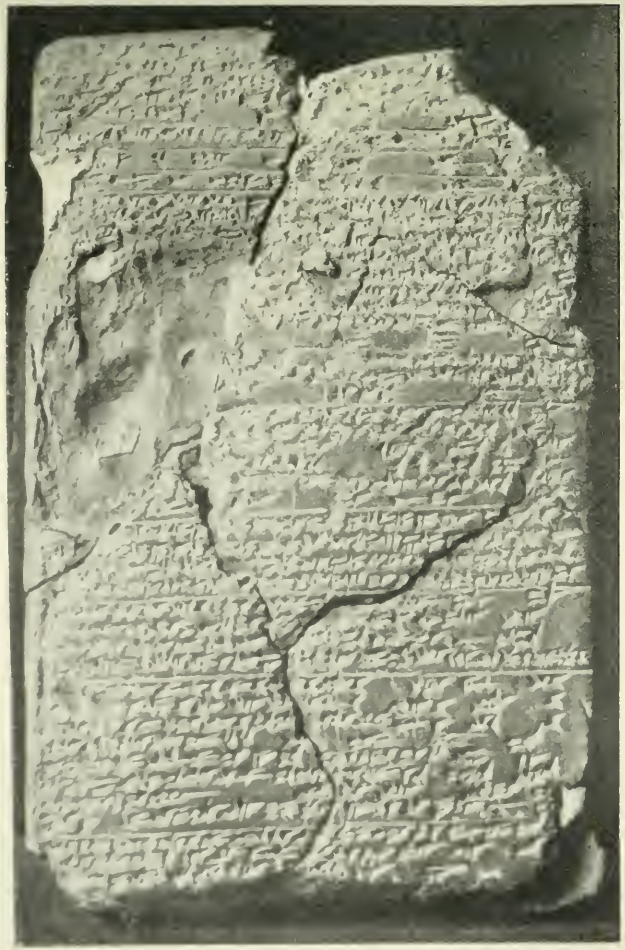

Fig. 10a.

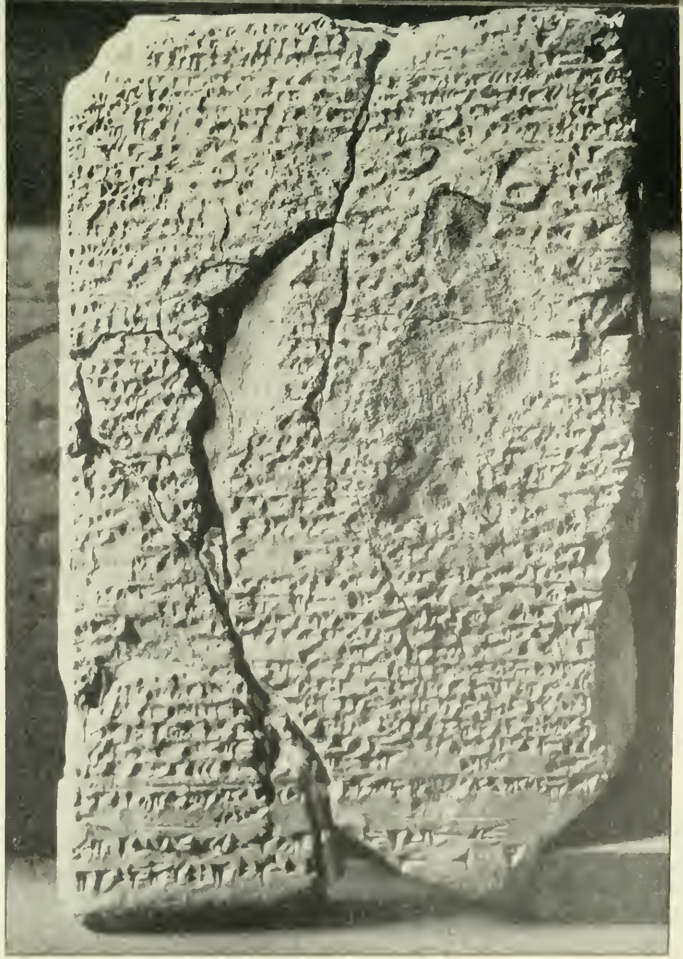

Fig. 10b.

Photograph of obverse and reverse of an Assyrian medical tablet dating from about the seventh century B.C., in the possession of the College of Physicians of Philadelphia, by whose kind permission the tablet is here reproduced. The tablet, which was purchased for the College of Physicians, is said to have been found at Kaleh-Shergat, the site of Ashur, the ancient capital of Assyria.

text reads,[1] "until the tears cease to flow; take a bandage and tie it on."

> "After that put him in a closed room; boil juice of kiptu,[2] strain it (?) to a Kan-Shar vessel,[3] and in the evening and morning rub his head."

Further directions are given to put a poultice of various ingredients around his head, to tie it with a strip of a coloured thread, to rub oil on his head, to keep him in a sheltered compartment, and to continue this treatment for three days. Despite the difficulty of identifying all the drugs mentioned, enough ingredients of the various poultices are clear, such as fat, various salt and alkalies, to show that the main thought was to reduce the swelling and by means of a wash, or ointment, to stop the flow from the eyes. The careful treatment—to keep the patient in a dark or sheltered compartment, so as to remain perfectly quiet, should be especially noticed, as well as the accurate indications to keep the bandage in place by means of a strip of some kind.

Our text then passes on to headaches, always regarded with great seriousness in antiquity, just because of their common occurrence. There is a special demon of headaches, *Ti'u*, whose functions cover the entire range of head troubles from an acute pain to insanity. The Talmud, which I have already quoted, has a significant saying about headaches and other ills[4]: "Any sickness, except intestinal trouble, any pain except heart spasms, any ache except a headache," and it adds rather cynically, "Any malevolence except that of a woman." The text prescribes[5]:—

> ["If a man's head burn,] his head oppresses him, particularly the vein of his temple, compound" (text defective) "with oil; wrap it around his head, press it on tight, and do not remove for three days."
>
> "If *ditto*, take one-third of a Ka of powdered juniper[6] wood, 10 shekels[7]

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[1] Lines 12-14 = "Cuneiform Texts," xxiii, Pl. 26, 6-7.

[2] She-gig = *Kiptu* (Meissner, *ibid.*, No. 5492)—some kind of grain in a decaying state as indicated by its occurrence among foul and ill-smelling substances ("Cuneiform Texts, &c.," xiv, Pl. 42, 29).

[3] Perhaps a mortar.

[4] Talmud Babli, Sabbath, fol. 11a.

[5] Obverse lines 18-26 = "Cuneiform Texts," xxiii, Pl. 32, 8-10, and 33, 10-14.

[6] *Shur-man* = Aramaic and Syriac *shûrbîna*. (*See* Löw, "Aramäische Pflanzennamen," p. 387 *et seq.*)

[7] Here used as a weight.

of powdered Cyperus,[1] 10 shekels of Cyprus,[2] 10 shekels of chicory (?),[3] 10 shekels of powdered cassia, 10 shekels of Tig-Gal flour,[4] 10 shekels of Tig-Tur,[5] 10½ shekels of dates, 10 shekels of thorn plant,[6] 10 shekels of good standing wine,[7] 10 shekels of powdered raddish;[8] mix them together, knead with wine into a solid paste, crush it and strain it, take one-third of a measure of it for the head which pains, knead it with cassia juice, wrap it around, attach" (by means of a bandage), "and *ditto*."[9]

Towards the close of the text there is a particularly striking relapse to the older form of sympathetic magic in the treatment of disease, and so undisguised a reference to the belief in a demon as the seat of disease, that I cannot resist the impulse to quote.[10]

> "If a man's forehead is affected and the demon in the man's body cries out[11] and does not depart, is not restrained through bandage or

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[1] Man-du to be read *suadu*, according to Meissner, "Assyrische Ideogramme," No. 3566, compared with No. 3544. In our text the word is introduced by the sign *Rik* placed before "green" plants, but in the parallel passage, "Cuneiform Texts," xxii, Pl. 33, 10, by the sign *Gish* placed before "trees," though in Pl. 37, 12, the sign *Rik* is found. There are many other instances of such variations in the use of determinatives. In this instance the variant indicates that a tree is meant. To be identified with Syriac *se'da*, as suggested by Holma, "Beiträge," &c., p. 78.

[2] Rik-Li = *burâshu* (Meissner, No. 3535), the common name for cypress in various Semitic languages. The sign for tree is frequently attached to the combination, thus Gish Rik-Li—i.e., a species of an evergreen tree. (*See* Löw, *ibid.*, p. 82 *et seq.*)

[3] Gish-Li Gam-Gam to be read *kukru*. I venture to identify it with chicory (Latin cichorium, Greek κιχώριον), which Pliny ("Nat. Hist.," xix, 39, and xx, 29) traces back to Egypt. If this be correct, the plant may have been imported into Babylonia from Egypt, though this is unlikely.

[4] Tig-Gal, frequently mentioned in medical and divination texts, designates some variety of grain with a large stalk.

[5] Tig-Tur, "small stalk"—another variety of grain.

[6] Zag-Khi-li = *sik-hlu* (Meissner, *ibid.*, No. 4658)—a weed of some kind.

[7] Bi = *shikaru*, "unmixed wine," followed by U-Sa, equivalent to Ush-Sa (so in our text, obverse, line 40) = *emêdu*, "standing," followed by the sign for *damku*, "good."

[8] She-Din = *puglu*, evidently identical with Aramaic and Syriac *pugla*, "raddish" (Raphanus Sativus). (*See* Löw, *ibid.*, p. 309.) The compound sign is identical with Meissner, No. 9706—a suggestion that I owe to Professor Ungnad.

[9] Repetition sign to indicate, as in the preceding paragraphs, "for three days do not remove."

[10] Rev. 29-33 = "Cuneiform Texts," xxiii, Pl. 49, 1-5; *see also* Frank in the *Zeits. f. Assyriologie*, xx, p. 438.

[11] The belief in demons taking possession of a man's body and crying out persists till New Testament times. See the instances recorded in Mark i, 23 (= Luke iv, 33), and Luke ix, 39, and the discussion of these and other passages in Ebstein, "Die Medizin im Neuen Testament und im Talmud," p. 57 *et seq.*

> incantation (that is, if all remedies fail), then slaughter a captured *Kurkū* bird, squeeze out its blood, takes its . . . . , its fat and the skin of its crop (?), burn it in the fire, mix cedar with the blood, and pronounce the incantation 'evil finger of man' three times," &c.

We are reminded of the sacrificial regulations in the Pentateuchal codes which prescribe in the case of one to be purified of disease the burning of parts of the animal offered as an atonement, while the blood is to be used to touch the right ear, the right thumb and the right large toe of the patient. The same rite is to be performed with the oil as an accessory to the sacrifice, and what remains of the oil is to be put on the head of the sufferer.[1] Our text thus throws an interesting light on Biblical rites which similarly rest on an endeavour to exorcise the disease and to make the sufferer immune against demoniac possession through being touched with the blood and with oil.

The examples given will suffice to show the general character of medical treatment among Babylonians and Assyrians at its best and worst, showing the hightest level reached, as well as the persistence of older methods. It is significant that even our physician, who extracted the larger handbook, included the old magical rite in his copy as a remedy to be resorted to in the last instance, which reminds us that even at the present time it is not uncommon for the quack, the herb doctor and the patent medicine man, who may be regarded as the modern representatives of the old Babylonian exorcisers, to be appealed to by patients in moments of despair, when rational remedies do not seem capable of affording relief.

On the basis of the examples furnished, we will be prepared to find a large number of diseases introduced into the medical texts, but what is more, we also find differentiations between various aspects of a disease having its seat in some particular part of the body. An enumeration, which does not aim at completeness, shows us colds, indigestion, vomiting, diarrhœa, cramps, rheumatism of the joints, neuralgia, hæmorrhages, eye troubles, heart diseases, bilious attacks, and various stages of jaundice. The diagnosis in many cases is detailed, and reflects considerable care in observing symptoms. A case of indigestion, accompanied by vomiting, is described as follows[2]:—

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[1] Leviticus xiv, 13-18.

[2] K 191, &c., i, 26-27 (Küchler, "Beiträge," &c., p. 3).

> "If a man has a pain in his stomach and cannot retain food, which comes back through the mouth, and his bowels (?) are loose, and he vomits and his flesh is inflated and there is wind rumbling in his anus, and diarrhœa has set in, take to cure him," &c., &c.

Naturally a condition of this kind may not only be due to various causes but may be the accompaniment of various disorders. The medicine of Babylonia-Assyria reaches its limit in the description of the symptoms, but, on the other hand, this lack of differentiation in the diagnosis is compensated for by the large number of remedies proposed, which it is fair to presume reflect the experience spread over long periods and which taught the physicans to be prepared for various causes leading to the same or to similar manifestations. Swelling, or distension of the stomach, with cramps and an inclination to vomit, is described as follows[1]:—

> "If a man's stomach is distended, and at the same time the muscles are contracted, and he is inclined to vomit, take," &c., &c.

A sour stomach with rumblings and vomiting is described as[2]:—

> "If a man [has acidity (?) and his stomach] is swollen and emits cries,[3] brings back food and drink, take," &c.

More briefly we find the case[4]:—

> "If a man's stomach is full of acid."

The diagnosis of a more complicated form of stomach trouble involving the chest and liver reads[5]:—

> "If a man's chest is affected, the stool is like urine" (i.e., a very thin, watery stool), "his throat hurts him in speaking, he vomits—all the man's insides are affected, take," &c., &c.

Still more detailed is the description of a generally disordered system, accompanied by fever.[6]

> "If a man, without eating anything, is inclined to vomit" (i.e., he is nauseated), "has much phlegm, the saliva that flows from his mouth is

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[1] K 71b, &c., ii, 17 (Küchler, *ibid.*, p. 22).

[2] K 71b, &c., ii, 58 (Küchler, "Beiträge," &c., p. 26).

[3] The cry of the demon is again meant, as above, p. 141.

[4] K 71b, &c., ii, 14, 28 (Küchler, *ibid.*, pp. 20 and 22).

[5] K 71b, &c., iii, 55-56 (Küchler, *ibid.*, p. [illegible]).

[6] K 61, &c., i, 27-30 (Küchler, *ibid.*, p. 44)

> bitter" (i.e., acidity in the stomach), "his face glows, his stomach is distended, his body is 'shrunk (?), his limbs (as) on a cold day shake[1] (?), food and drink cause pain, he drinks a great deal of cold water, he vomits, wind rumbles in his anus, the muscles of his body ache and seem weak, the fleshy parts are painful, whatever he eats does not agree with him, take," &c.

Liver troubles, so common among men and animals in southern climates, naturally play a prominent part in the general texts. The general term for an affection of the liver is "gall sickness," and the chief aim of the physician appears in such cases to have been to secure an opening of the bowels, so as to relieve the system of the defectively assimilated food. An unusually large number of remedies, however, are set forth, pointing, as I venture to think, again to the recognition of many varieties of gall troubles, even though this does not appear in the diagnosis.

Among symptoms of "gall sickness" we find pains in the head, neck, the middle body, and the feet, and that the face assumes a sallow appearance. A more detailed diagnosis of an internal disturbance placed with diseases of the liver reads[2]:—

> "If, while eating, a man has a pressure at the pit of the stomach, accompanied by heartburn,[3] and the patient vomits gall, that man suffers from severe *tugatu*"—a designation which escapes interpretation for the present.[4]

The indications of the disorder leading to jaundice are appropriately described as accompanied by "yellowness of the eye."[5] Jaundice itself bears the name *amurriḳanu*, which is the exact equivalent of our modern term, and is also the name which occurs in the Talmud.[6]

We find in the medical texts a number of descriptions indicative of various stages in jaundice.[7]

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[1] I.e., he has chills.

[2] K 61, &c., ii, 23-24 (Küchler, *ibid.*, p. 50).

[3] Literally "heart-fire," the same term, therefore, that is still used in modern parlance.

[4] See Holma, "Beiträge," &c., p. 8, note 1.

[5] E.g., K 61, &c., iii, 4, 6; iv, 16, 17 (Küchler, *ibid.*, pp. 54-58).

[6] *Yerakón* (see Jastrow, "Talmudic Dictionary," *s.v.*); cf. K 61, &c., iii, 7; also "Cuneiform Texts," xiv, Pl. 26 (K 14047), list of medicinal plants for *amurriḳanu*, *akhkhazu* (an advanced form of jaundice), and Tu (bowel [?] trouble); Pl. 48 Rm., 328, rev., 10-13, prescription for *amurriḳanu*. See also Pl. 37 (Rm. 357).

[7] K 61, &c., iii, 4-5 (Küchler, *ibid.*, p. 54).

> "If a man is affected with yellowness of the eye, and the disease spreads into his eye, causing a flow of tears . . . his abdomen is swollen, he gives back food and drink, that man is affected all over by the sickness, and will die."

No medicinal treatment is prescribed in this case nor in the following[1]:—

> "If a man has yellowness of the eye, his head, his face, and all his body is affected to the root of his tongue, which is affected, it is hopeless (?), he will die."

A simple definition of jaundice is added as a means of recognizing the disease[2]:—

> "If a man's body is yellow, his face yellow, his flesh is steadily shrinking, that is *amurrikanu*."

Another designation of the disease in an advanced form is *akhkhazu*, a term which, it will be recalled,[3] is personified as the demon of a specified disease. The diagnosis reads[4]:—

> "When a man's body is yellow, his face is yellow and black, the root of his tongue is black, that is *akhkhazu*."

The dark colour at the back of the tongue was apparently looked upon as an important symptom of an advanced stage of the disease; though I have been unable to satisfy myself that this symptom is characteristic. It may be that a thickly coated tongue is meant.

The treatment prescribed consists of drinking in wine a certain kind of "serpent of the field" that has been baked; which suggests a magic rite rather than a medicinal mixture. Very significantly the customary phrase "he will recover" is not added; instead, an expression is introduced which is evidently intended to convey the thought that relief will be afforded,[5] but no complete cure. It is in keeping with this view that *akhkhazu* in a chronic stage is generally set down as hopeless.[6]

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[1] *Ibid.*, line 6.

[2] *Ibid.*, line 7.

[3] See above, p. 114.

[4] K 61, &c., iv., 26 (Küchler, *ibid.*, p. 60).

[5] *Akhkhazu sha libbishu* Si-Di (am) [= *ishshiram*] = i.e., "the *akhkhazu* of his insides will be better."

[6] K 61, &c., iv, 45-46; also 43-44 (Küchler, *ibid.*, p. 64). In line 30 no treatment is indicated, and in line 31 we must probably supply Si-Di (*am*) as in line 26, but line 28 reads "he will recover."

> "When a man has *akhkhazu*, his head, his face, his whole body and even the root of his tongue is affected, the physicians should not treat him [literally, 'should not bring his hand to him'], that man will die, he cannot recover."

Coming to eye diseases, which were so common at all times in the Orient, as they still are at the present time, we find a number of incidental references in connexion with headaches and fevers.[1] No doubt among unpublished fragments, many will be found dealing specifically with eye troubles.

> ["If the right side of a man's forehead] is affected, and the tears of his right eye are involved,[2] take bits of powdered turnip seed[3] mixed together with . . , pour cassia juice over it, apply to the forehead, and he will recover.
>
> "If the left side of a man's forehead is affected and the tears of his left eye are involved, take bits of oleander,[4] crush and strain, pour into heated wine, apply to his forehead, and he will recover.
>
> "If both sides of his forehead are affected, and the tears of both eyes are involved, take bits of oleander, cassia, powdered turnip, finely cut radish, mix together in a Kan-Shar vessel, pour cassia juice (over it), bind both sides of the forehead, and he will recover."

Cases of bloodshot eyes[5] are mentioned in connexion with headaches, and again a distinction is made as to whether the right or left eye is involved.

A headache on the right side with a swelling in the right eye and abundant flow of tears is put down as "Due to the hand of a demon,"[1] and the remedy prescribed is to "rub the head with finely powdered bits of human bone mixed with cedar oil." A similar explanation is offered for headaches accompanied by vomiting and swelling of both eyes, while a persistent headache lasting from sunrise to sunset is ascribed to the machinations of a demon or a sorcerer, as the case may be.[2]

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[1] "Cuneiform Texts," xxiii, Pl. 42, 20-25.

[2] I.e., the tear-sac is choked up.

[3] She-Sa-a, with a sign indicating a flour made of it, is to be read *laptu*, as shown by Meissner, *Zeits. f. Assyriologie*, vi, p. 295, and is, as the Aramaic and Syriac equivalent *lapta* indicates (Löw, *ibid.*, p. 177), the common turnip (*Brassica Rapa*). It is one of the most common ingredients in the medical prescriptions of the Babylonian and Assyrian "healers"—generally, as in our passage, in powdered form to aid in making a paste.

[4] Khar-Khar = *khaldappanu*, which, as Küchler ("Beiträge," &c., p. 85) suggests, is to be identified with Talmudic and Syriac *hardûp*, "Oleander" (Löw, "Aramäische Pflanzennamen," p. 131), in which languages it is probably a loan-word from the Babylonian. The Greek *Rododaphne* would then be a further corruption from *Khaldappanu*, superinduced by a species of popular etymology to connect the word with *rodon*, "rose," and *daphnē*, "laurel." The variety of forms under which the word appears in Talmudical passages, including *hardaphnin*, which comes close to *Khaldappanu*, speaks in favour of its being a loan-word to be carried back to a Babylonian origin.

[5] "Cuneiform Texts," xxiii, Pl. 43, 26-29.

A distinct case of an injury to the eye, with a detailed account of rapid progress, is referred to in a letter of a physician, Arad-Nanâ to Ashurbanapal, found in the Archives Section of the royal library.[3] The patient is a little son of the king about whose condition the father seems much worried. The nature of the injury is not disclosed, but indications point to a wound above or below the eye which has been discharging pus.

> "Arad-Nanâ to the king my Lord, Thy servant Arad-Nanâ. Hearty greetings to the king, my Lord. May Ninib and Gula[4] grant happiness and health to the king my Lord.
>
> "Hearty greetings to the little chap whose eye causes him trouble. I put a bandage[5] on his face. Yesterday, towards evening, I took off the

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[1] "Cuneiform Texts," xxiii, Pl. 44, 5-6. The sign used—as also above, p. 140—designates the ghost who, according to common beliefs, was a demon who had the power of taking up his seat in a living person and causing no end of pain and mischief. Diseases thus directly ascribed to ghosts are very frequently referred to in medical texts—e.g., K 4075, 4609b (with prescriptions), 10658, 11772, 14166, according to Bezold's "Catalogue of the Kouyunjik Collection," &c.

[2] "Cuneiform Texts," xxiii, Pl. 44, 7-9, *kât alpi*, "hand of an ox," where, however, *alpu*, as in Boissier, "Documents Assyriens relatifs aux Présages," p. 245, line 19, is to be regarded as the name of a demon, having the head or shape of an ox. Hence the sign for an ox has as one of its equivalents *eṭimmu*, which, originally a ghost, becomes a generic name for a demon. See preceding note and cf. Brünnow, "Classified List," No. 5738, and Meissner, "Assyrische Ideogramme," No. 4038, where the same sign equals *mâtu*, "to die."

[3] Sm. 1064, published by R. F. Harper, "Assyrian and Babylonian Letters," iv, No. 392. We owe to Professor Harper the publication of the extensive and exceedingly valuable official correspondence in Ashurbanapal's library covering all possible subjects. Up to the present Professor Harper has brought out eleven volumes of such texts. Included in the collection are quite a number of letters from physicians or upon medical subjects—e.g., (the numbers according to Harper's edition), Nos. 108-111, 157, 218, 391, 1157.

[4] In these medical letters the gods invoked in the greeting, with which a letter invariably begins, are Ninib, the god of healing, and his consort Gula. In other letters the gods most commonly invoked are Marduk and Nebo (or in reversed order), though the moon-god, Sin, and his consort Nin-gal are sometimes substituted for Marduk and Nebo. Frequently, however, a longer list of deities is introduced in the greeting.

[5] The word used is *ta'alitu*, literally "a covering." Johnston, in his admirable monograph on "The Epistolary Literature of the Assyrians and Babylonians," *Journal of the American Oriental*, xviii and xix, has discussed this and some other medical letters.

> bandage that had been applied, removing also the dressing below, and there was blood on the dressing as much as the point of the little finger. To which ever one of thy gods this is due, his command has surely been heeded.
>
> "Hearty greetings. Let the king my Lord, rest assured; in seven or eight days he will be well."

Hardly any comment is needed on this very explicit letter. The physician has placed a dressing on the eyes containing no doubt some ointment, and he has fastened the dressing by means of a bandage around the face of the patient. He reports that bandage and dressing were removed to observe the healing process; that he found the wound almost healed. Modestly, or shall we say in accordance with current beliefs, he ascribes the unexpectedly rapid cure to the intervention of some god, and confidently predicts a complete recovery within a week. This is only one of many letters of physicians found in the extensive collection of official reports to the kings, and since through such reports we enter, as it were, into the physician's workshop and can observe the healer, as he is called,[1] in his relations to his patients, I venture to place a few more before you, which will also lead us to the next point to be considered—the methods of treatment. This same Arad-Nanâ writes to the king to reassure him regarding an eruption of some kind with which his royal master has been affected. After the usual salutations Arad-Nanâ writes[2]:—

> "As to the eruption (?)[3] concerning which the king has made inquiry . . .[4] for the rest of the time he should take a complete rest. Let the king apply[5] to his chin. Let the king draw pure water with which to thoroughly wash the hands of the king, my Lord. Do not worry. Soon the eruption will pass away."

A rest cure is here ordered as part of the treatment, and if my interpretation is correct, the king is cautioned to wash his hands thoroughly after he has put the ointment on his face, more particularly the chin, where the seat of the trouble appears to have been.

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[1] *Asu*, a word which has passed into all Semitic languages (Hebrew, Arabic, Aramaic and Syriac) in the same sense, evidently under the influence of Babylonian-Assyrian medicine.

[2] K 576 (Harper, No. 110).

[3] *Iṣṣadi*, an unknown word which from the context appears to be a boil or an eruption on the face.

[4] Text defective for several lines.

[5] *Lip-pi-shi-ish* from *pashâshu*, the technical term for rubbing an ointment or salve on any part of the body. Evidently Arad-Nanâ has prescribed some ointment for the disease from which the king is suffering.

There is a very human touch in the criticism passed by the same Arad-Nanâ in another letter upon a wrong treatment apparently prescribed by a colleague. It is again the king's son, who this time is suffering from hæmorrhages of the nose. Whether it is the same son we cannot tell, as names are not mentioned. Arad-Nanâ has apparently been called into consultation to ascertain why the bleeding does not stop. He reports as follows [1] :—

> "To the king my Lord, thy servant Arad-Nanâ, Hearty greetings to the king, my Lord. May Ninib and Gula grant the king, my Lord, happiness and health.
>
> "Hearty greetings to the king's son. The treatment which we prescribe for him is to be given every two-thirds of a double hour during the day.[2] . . . . . .
>
> "In regard to the bleeding of his nose about which the Rab-Mugi [a high official] has reported to me that yesterday toward evening there was much bleeding, those dressings are not properly applied; they have been placed upon the alæ of the nose, obstructing the breathing, while at the same time the blood flows into the mouth. Let the nose be plugged up to the back so that air will be held off, and the bleeding will cease. If it please the king I will come to look at it to-morrow. Meanwhile may I hear good news."

Evidently an attempt was made to stop the bleeding by merely plugging the alæ, the result of which was that the blood flowed backwards and came out through the mouth. As the spot from which the bleeding came was not covered, Arad-Nanâ's advice is to plug up the nose completely.

In a third letter [3] Arad-Nanâ assures the king that he need not worry about the condition of his son, whom he here mentions by name—namely, Ashur-mukin-palû'a. The text of the first part of the letter after the customary greetings is defective. From the reverse of the tablet we learn that the king had been suffering from a toothache—perhaps an ulcerated tooth. This portion reads as follows:—

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[1] *Harper*, No. 108 (K 519). *See* Johnston, "Assyrian Epistolary Literature," p. 103 *et seq.*, and von Oefele, "Keilschriftmedizin in Parallelen," pp. 22-23.

[2] The Babylonians and Assyrians divided the full day into twelve double hours. As a survival of this method based on the sexagesimal system, we still have only twelve numerals on our watch dials and divide day and night each into twelve hours, instead of counting the hours of a full day consecutively from one to twenty four, as indeed is now done in the time tables of Belgian railways. Every two-thirds of a double hour would therefore be every eighty minutes. The following four lines are obscure.

[3] Harper, No. 109 (K 532).

> "As for the cure of the tooth, about which the king has sent word to me, I am very happy to learn that the tooth about which the king has sent word to me is indeed healed as the king has informed me. Your worry is uncalled for that I should go to see Ashur-mukin-palû'a. I have already been to seen him. But I intend to come again to inquire about the health of the king. Meanwhile let the king continue the treatment for a month—then there will be no relapse (?)."[1]

Arad-Nanâ has been treating both father and son. He has cured the former but not the latter; and the king is worried about his son's condition. The physician says that the king need not urge him to see the prince, that he is attending to the case, but that the king should look after his own health and continue the treatment prescribed.

The association of ideas in our language between a "patient" and "patience" speaks well for the reputation acquired by sufferers, but it is not often justified. It would probably be nearer to the fact to make "patient" a synonym of "impatience"—and naturally one's impatience is reserved for the physician. Some member of the royal court is ill and the king has sent an inquiry to the physician, Ikkaru by name, which evidently contained a reproach that the cure was not proceeding as rapidly as the patient and his royal chief hoped for. Ikkaru replies as follows[2]:—

> "To the king, my Lord, thy servant Ikkaru. Very hearty greetings to the king, my lord. May Nebo and Marduk bless the king, my lord! May Ninib and Gula[3] grant happiness and health to the king my lord. As for Iratti,[4] about whom the king my lord [has sent word to me], I am treating him and taking great trouble about him. He was not able to come as yet,[5] for the king my lord ought to know that he is a sick man.
>
> "The drugs[6] of the king for the cure [of Iratti (?)] have not yet had an effect. The wash[7] will have to be applied twice and three times, before he will be relieved."

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[1] Last word of the text is doubtful. My rendering is merely a guess.

[2] Harper, No. 248 (K 502).

[3] Our writer, it will be observed, wrote both Nebo and Marduk—the customary salutation—and then adds the specific invocation of the physician.

[4] No title is added, so that we do not know what rank he occupied, but it is evident that he must have stood close to the court.

[5] The king has evidently asked the physician why Iratti does not come to the court.

[6] *Ur-ki-te*, literally "herbs," which is here used generally for drugs, just as is the case in the medicine of the Middle Ages, though he uses other remedies than herbs.

[7] *Mar-khi-ṣi*, the medical term for a "wash" so frequently referred to in the medical texts.

My last example of this medical correspondence which throws such a valuable light upon the standing of the physician at the Assyrian court strikes a familiar note, one that will arouse your sympathy for your colleague of 2,600 years ago. The king is suffering from an attack of rheumatism which seems to have been very persistent and refused to yield to treatment. Naturally, the blame again is put on the physician — the same Arad-Nanâ — and curiously enough the latter confesses that he had not understood the nature of the trouble, but that he now feels certain of getting at the root of it. Here is what he writes[1] :—

> "The king my Lord continues to declare 'the state of this sickness of mine thou dost not recognize, thou dost not bring about a cure.' Now I confess that hitherto I did not understand this rheumatism,[2] but now I seal this letter to send it to the king my Lord. Let it be read to the king my Lord and properly understood. When it reaches the king my Lord let a physician . . . carry out the accompanying directions. Let the king apply this liniment.[3] If the king does this, soon this fever will leave the king my Lord. A second and a third time this oil liniment should be applied to the king my Lord. The king must see to this. If it please the king let it be done in the morning. This disease is in the blood. Let them bring the king a *silbani*,[4] as was twice done already, and let it be vigorously done. I shall come to inform myself, and as soon as the perspiration flows freely from the king, my Lord, I will send to the king, my Lord, something to apply to the king's neck. With a salve which I shall send the king let the king be rubbed at the appointed time."

The treatment of rheumatism by means of liniments and salves will appeal to us as natural, but the number of such remedies prescribed—no fewer than three kinds being specified—raises a suspicion that Arad-Nanâ, despite his assurance that he had now grasped the nature of the disease, was continuing his experiments in the hope of striking an efficient combination of drugs.

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[1] Harper, No. 391 (83, 1-18, 2); translated and discussed by Van Gelderen, in "Beiträge zur Assyriologie," iv, pp. 520-521.

[2] Literally "sickness of the muscles."

[3] *Mar-khu ṣu*, the same word as above, p. 150, note 7. Evidently the wash or liniment was sent with the letter.

[4] *Ṣilbanu* is dried liquorice root (cf. Löw, *ibid.*, p. 378), but in this passage a liniment or a massage treatment appears to be intended.

[5] *Napshaltu*, a word of frequent occurrence in medical texts to designate a salve or ointment.

Let me conclude this portion of my subject by reading to you the symptoms of a disease in one of the medical texts so perfectly described as to require no further comment, except to note an absence of a sense of humour on the part of the compilers of medical texts, who diagnose a "drunk" with the same seriousness as a case of jaundice. Sandwiched in between a description of bowel and chest troubles we read[1]:—

> "If a man has taken strong wine and his head is affected and he forgets his words and his speech becomes confused, his mind wanders and his eyes have a set expression; to cure him take licorice, Shi-man-plant, beans (?), oleander, and so forth [eleven drugs in all are enumerated], to be compounded with oil and wine before the approach of the goddess Gula[2] [i.e., in the evening] and in the morning before sunrise, and before anyone has kissed him let him take it, and he will recover.

A German scholar, commenting on this passage, soberly suggests that it points to the custom in Babylonia and Assyria to kiss one another in the morning. Perhaps I am mistaken in thinking that the compiler of the prescription was entirely devoid of a sense of humour, and that he added this touch as a suggestion that to kiss a man who comes home in such a condition might not be an unalloyed pleasure. At all events, the naïve description of the unmistakable symptoms of a spree is delicious as well as true to nature.

It is almost humiliating to be obliged to confess that of the eleven drugs introduced in this prescription, despite the fact that six are of very common occurrence, we cannot with any degree of certainty identify more than three of them.

V.

This brings me to the next point to be briefly considered—medicinal remedies. There are considerably over a hundred drugs included in the medical texts so far published. That the number in use, however, was much larger is shown by long lists of drugs found in the text-book division of the royal library and which furnishes, therefore, a most valuable supplementary source for the study of Babylonian and Assyrian medicine. These lists, of which we now have a large number at our disposal, consist of enumerations of plants, herbs, weeds, thorns, woods, roots, juices, and stones, with explanatory comments attached, indicating at times the phonetic reading of the signs, at times the class of substances to which the names belong or the genus of which they are a species. Other explanations attached to the lists indicate the use to which the drugs are to be applied, and with what other substances they are to be compounded. The lists were evidently drawn up by the priests as aids to the study of medicine, to be used in the temple schools for the training of those who were to take their place in the community as "healers." The number of drugs is thus increased to the volume of an extensive pharmacopœia, comparing favourably in extent with modern compilations.

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[1] K 71b, &c., iii, 51-54 (Küchler, "Beiträge," &c., pp. 32-33).

[2] The phrase, whatever its origin, is a synonym of the "rising of a star" (above, p. 132, note 5) as a sign of evening.

Over three hundred substances are mentioned in these lists so far as published. The largest share is taken by plants and shrubs, and among those that may with greater or less certainty be identified are mint, liquorice, rape or colewort, coriander, cummin, carraway, cassia, onions, leek, radish, mustard, lily, jasmine, nard, mushroom, colocynth, portulaca, anise, rocket, Star of Bethlehem (ornithogallum) and cynoglosson (which, as already pointed out,[1] bears a name that is an exact equivalent of the Greek term, "grain," "wheat"); and a large variety of reeds and thorny plants. Indeed, so predominating is the use of plants—the seeds, the juices, and the leaves being utilized—that the sign U for plant, which is to be read for *shammu*, becomes the general determinative placed before all substances used as drugs in these long lists.[2] Quite irrespective whether the drug is a wood, a shrub or a vegetable, it is introduced by the sign *shammu*, which thus becomes the general term for drug, and passes over in this sense into the Arabic, Syriac, Aramaic and Hebrew—probably under the direct influence of Babylonian and Assyrian medicine. Next to plants we have a large number of trees and shrubs, the roots, twigs, bark, sap and seeds of which were used. Among those which may be identified are the cedar, the cypress (though there is also a cypress plant), the tamarisk, the myrtle, the willow, the fig, and the olive. Thirdly, we have many mineral substances including various alkalies and salts, and lastly many stones,[3] which were crushed and used as ingredients in concoctions, but more particularly in ointments and salves. It is a fair inference that the use of stones as amulets was also a factor in their introduction into medicinal compounds, for the stones mentioned include those to which a special significance as protection against demons was ascribed. These lists of stones are introduced by a sign to be read *Na* in Sumerian, and *abnu* in Babylonian. A prolonged study of the *shammu* and *abnu* lists has convinced me that the Babylonians intended to indicate by the signs for these two terms the broad distinction corresponding to our organic and inorganic substances.[1] If this view should turn out to be correct, it would lead us in our further attempts to identify terms introduced in the long lists of stones beyond the purely mineral kingdoms, just as the plant list extends beyond the scope of the vegetable kingdom because of the generic use of the sign for plant to designate any kind of a drug. The list of drugs thus grouped into two large classes constitute adjuncts to the medical text-books proper and serve the very important purpose of a secondary source. It is interesting to note further in these lists attempts at a scientific or quasi-scientific grouping of drugs that have some elements in common. So we find a group of substances placed in a class of cultivated plants followed by a list of thorns, woods and shrubs that grow wild.[2] The lists also show us the extent to which drugs were imported from other countries. For example, among the thorns there are mentioned four varieties of *dadanu*,[3] one as growing in Subari (an old name for Assyria),[4] two—a much larger variety—in Kinakhkhi (which is the Babylonian form of Canaan), and a fourth in Melukhkhi (which, according to some scholars, designates a section of the peninsula of Sinai, but according to others is to be sought along the African coast).

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[1] Holma, in his "Beiträge zum Assyrischen Lexikon," pp. 57-91, has succeeded in adding considerably to the identifications of Babylonian-Assyrian plant names. The little volume is a most valuable contribution to the medicine of the Babylonians and Assyrians. Above, p. 133, note 4.

[2] A large number of such lists are published in "Cuneiform Texts," xiv, Pl. 10-19; see also "Cuneiform Texts," xi, Pl. 45, 46. *See* fig. 11 for a specimen.

[3] *See*, e.g., "Cuneiform Texts," xiv, Pl. 11-17.

Of special interest are lists of drugs with indications of the diseases for which they are to be used[5] or of the manner in which they are to

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[1] The detailed proof of this thesis must be left for another occasion. *See* incidental remarks in connexion with the explanations attached to figs. 11-16.

[2] "Cuneiform Texts," xiv, Pl. 21, col. 5; *erishtum* (cultivated) as against *ashagu* (wild growing weeds).

[3] *Ibid.*, lines 18-22.

[4] Also mentioned as the provenance of a plant in "Cuneiform Texts," xiv, Pl. 36 (K 10126, &c.), line 8, and Pl. 31 (K 4586), line 7, where the name is written in the more common ideographic fashion.

[5] E.g., "Cuneiform Texts," xiv, Pl. 23 (K 9283 and K 254); 26 (K 14047); 30 (Sm. 698); 36 (81, 2-4, 267); 37 (RM. 357); 43 (Sm. 60, &c.); probably also 24 (K 4438A) and 26 (K 5440B).

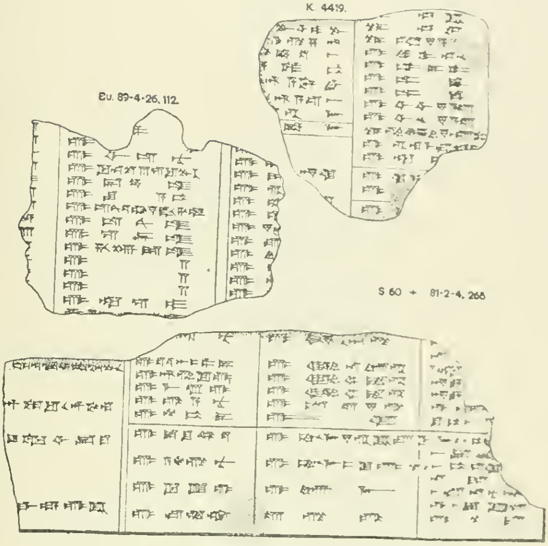

FIG. 11.

Lists of medical drugs. ("Cuneiform Texts from Babylonian Tablets, &c., in the British Museum," part xiv, Pl. 43.)

The upper fragment to the right (K 4419) contains in the left column a list of stones used in medicine, and in the right column a list of plants and seeds. The sign for stone (Na = *abnu*) may be seen in the third line of the left-hand column and in the eighth line, which contained a summary of the number of stones enumerated. The sign for plant (*U* = *shammu*) introduces the substances named in the right-hand column, beginning with line 4.

The fragment to the left (Bu. 89, 4-26, 112) consisted probably of four columns. The columns partially preserved contain lists of substances introduced by the sign for plant. In the one column is given the phonetic spellings of plants, in some cases accompanied by explanatory additions. The ideographic forms must therefore have been furnished in the column to the left of which only the traces at the end of the lines appear, and which formed the first column. The other column contains the beginning of lines giving ideographic forms of plants, the phonetic spellings of which filled the missing fourth column.

The lower fragment (S. 60 + 81, 2-4, 265) contains to the extreme left the colophon of the tablet, indicating that the tablet belonged to the collection of Ashurbanapal, and recording in the second (visible) line the names of Ninib and Gula—the god of healing and his consort—at whose instance the king tells us that he made the collection of the medical division of his library. Ninib and Gula, it will be recalled (above, p. 117), are the deities invoked in the greetings at the head of letters from physicians.

The second column gives the names of medicinal plants, the third the disease for which the drug is to be used, and the fourth the manner of its use. Thus the plant or drug "brilliant *khaldappanu*" (perhaps "oleander"—above, p. 146) is to be used for sickness of the nostrils. The following lines read:—

Tigilu for *mitri* sickness (perhaps some part of the nose).
Shibrû for *mitri* sickness.
Gânu for inflammation of the throat.
Sap of tamarisk for inflammation of the throat.

The use of the sign for plant in the column specifying the disease is an incidental proof that the sign has acquired the generic force of "drug." See above, p. 153.

be employed, as liniments, or to be taken in wine, to be taken fasting, mixed with honey, oil and strong drink, or in water or in milk.[1] A series of remedies are given in one of these lists for bites of a dog or a snake, or the sting of a scorpion, or a blow of some kind (fig. 12). Some of the remedies thus indicated are to be applied to the bitten spot, several are to be made into an ointment and placed around the neck, or to be taken in wine, or wine mixed with oil. In one case it is specified that the oil is to be heated; in another that the leaves of a plant are to be applied to the face of the sick person. A compound frequently occurring both in medical and in ritual texts is known as *Ninib* salve—the god Ninib being, as you recall, the special god of healing—and we are told in a list of remedies that the salve is to be used in a disease of the joints, *bennu*, mixed with oil,[2] while another substance, unidentified as yet, is to be rubbed on the neck for the same trouble.[3]

We have a long list of drugs to be used in the case of eye diseases,[4] presumably as washes and ointments. Among these the root and seed of cynoglosson occurs,[5] beside the seed of various reeds, plants, and thorns, leaves of tamarisk, and the thick juice of a plant *il*. I believe that I can identify another drug as made of the marrow of beans, and a point of special interest is the specification of *kukru* (which, as already suggested, is our chicory), mentioned among the ingredients for cases of "double vision,"[6] as the literal rendering of the word would be, that is, a disturbed vision in which objects appear double—diplopia. Another list gives the names of a series of drugs to be used for diseases of the mouth, which include inflamed gums, swollen cheek, and ulcers.[7] Lists of this kind are usually arranged in three columns, the first column furnishing the name of the drug, the second that of the disease for which it is to be used, and the third how it is to be used. Thus, the drug "male pestilence root" is described as a drug for sickness of the mouth, to be placed on the mouth.[8] Of a thorn root to be

---

[1] E.g. "Cuneiform Texts," xiv, Pl. 23 (K 9283); 26 (K 9147); 27 (K 8827); 29 (K 4566, &c.); 31 (D.T. 136).

[2] "Cuneiform Texts," xiv, Pl. 23 (K 9283), line 17.

[3] *Ibid.*, line 18.

[4] *Ibid.*, Pl. 29 (K 4566, &c.).

[5] *Ibid.*, lines 8 and 15.

[6] Lines 31, 32.

[7] Pl. 23 (K. 259), *see* fig. 12.

[8] In the text referred to in the preceding note.

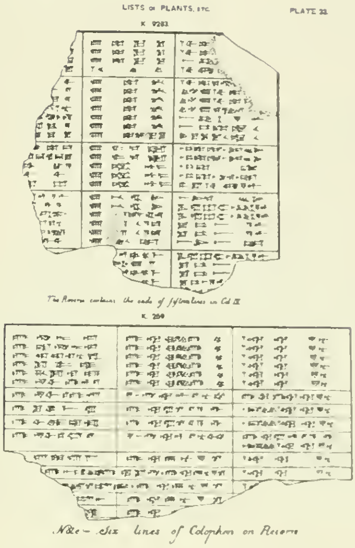
LISTS OF PLANTS, ETC.
PLATE 23
K. 9283
The Reverse contains the ends of fifteen lines in Col III
K. 259
Note — Six lines of Colophon on Reverse

FIG. 12.

Three-column lists containing names of plants or drugs, the ailment for which they are to be used, and how they are to be taken or how applied. ("Cuneiform Texts," xiv, Pl. 23.)

The fragment of the upper plant specifies in the first division of the second column that the plants in the first column are to be used for "dog bites." In the second division were enumerated six drugs for "serpent bites," while in the seventh line of this division a drug was named good for both serpent bites and dog bites. In the third column of this second division are such specifications as that a certain medicinal substance is to be placed around the neck, another to be taken in wine.

In the fourth division the first line reads:—

Ninib-salve	for *bennu* sickness	to be mixed with oil

(For Ninib-salve see above, p. 156. Bennu is a disease of the muscles—probably a form of rheumatism.

The first division of the larger tablet furnishes six substances to be used as follows:—

Male pestilence root ...	A drug for sickness of the mouth	To be placed upon the mouth
Root of male pestilence root ...	,, ,, ,,	,, ,, ,,
Green kulkullanu ..	,, ,, ,,	,, ,, ,,
Turnip	,, ,, ,,	,, ,, ,,
Khalulaia	,, ,, ,,	,, ,, ,,
Root of sun plant ...	,, ,, ,,	,, ,, ,,

used for mouth troubles, it is said that it must not be plucked while the sun shines. In another line of the text where the same precaution is added, it is to be compounded with white *karuti* (perhaps an onion variety), mixed with oil and placed on the mouth. Several plants, including turnip seeds, are enumerated as remedies for a swollen cheek. It is quite likely that such fragments belong to a series in which in succession the drugs for all diseases were enumerated with indications for their use. To this series would then belong another tablet of which only a portion has been preserved, setting forth drugs for diseases of the anus, which are to be mixed with oil or fat, or with sweetened wine, and to be applied to the anus, though in one case it is specified that the leaves of the drug are to be taken in wine.[1] Other portions of this series would be represented by fragments dealing with diseases of the heart, of the head and throat,[2] with such interesting specifications as pain of the throat, cold of the throat, inflammation of the throat, swelling of the throat, heart spasms, enlargement of the heart, heartburn affecting the throat, and so forth. In the same way we find remedies for diseases of the nose,[3] for miscarriage, for sterility,[4] and if my interpretation of a passage in this list be correct, for abortion.[5]

Of curious interest as introducing us to the Babylonian and Assyrian "Dreckapotheke," are lists intended to indicate the nasty and ill-smelling substance with which a genuine medical remedy is to be compounded,[6] the remedy for the purpose of helping the patient, and the nasty drug in order to disgust the demon. In this way the chicory plant is to be mixed with a green frog, pestilence root with a claw of a black dog, a thorn plant with earth taken from the "outer gate," a green vegetable of some kind with the dust of a man's foot.[7] From such substances we pass to swine's fat, swine's tail, dog's dung, the neck of a dog, the foot of a small insect, the fat of a serpent, excrement of man, and urine,[1] the hair of a virgin goat,[2] human bone,[3] and so on through a long array.

---

[1] Pl. 30 (Sm. 698); *see* fig. 13.

[2] Pl. 36 (81, 2-4, 267).

[3] Pl. 43 (Sm. 60, &c.), fig. 11.

[4] Pl. 36 (79, 7-8, 22, and Rm. 2, 412).

[5] Pl. 36 (79, 7-8, 22, line 4 = Rm. 2, 412, line 9), *shalputi*.

[6] Pl. 28 (K 4140A); 41 (Rm. 2, 497); 42; 44 (K 4152); also Pl. 10 (at least the obverse), which is erroneously designated in the British Museum publication as "Lists of Animals, &c." An incidental proof that these lists are to be interpreted in the manner here suggested is the specification "take" with, &c.—e.g., Pl. 10, obv. 10.

[7] These examples from K 4152 ("Cuneiform Texts," xiv, Pl. 44); *see* fig. 15.

The partial enumeration of the strange substances thus grouped together is sufficient to show that we are not dealing with such drugs as by experience were found to be directly beneficial. The point of view is of a more primitive order, and directed towards the demon as the cause of the disease. The substances constitute the "sick diet"

S. 698.

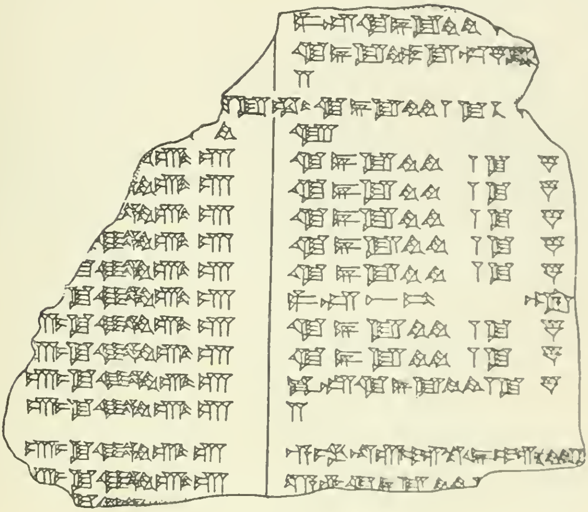

FIG. 13.

List of drugs for diseases of the anus. ("Cuneiform Texts," xiv, Pl. 30)

The list consisted originally of three columns. The first column, which is entirely missing, contained the names of the plants, the second column indicates that all the drugs enumerated were to be used for "disease of the anus," while the third column specifies the manner of applying the drug—reading in part as follows :—

its twig (i.e, of the plant named), mixed with oil [to be placed on the anus].
mixed with oil and placed on the anus
(repeated in the following six lines).
its twig to be taken in wine.
mixed with oil to be placed on the anus.
Ditto ditto.
the green part (i.e., of the plant named) mixed with oil to be placed on the anus.
Ditto ditto.

---

[1] These examples from K 4152 ("Cuneiform Texts," xiv, Pl. 11) and K 4164 (Pl. 12); see figs. 14 and 15.

[2] Pl. 28 (K 4140A), lines 6, 7.

[3] Pl. 28 (K 4140A), line 12.

for the demons, and you will agree that they are sufficiently unpleasant to serve such a purpose. On the surface it would appear that the substances enumerated are all of a kind calculated to disgust the demons, to drive them away by their nasty odours; but since there is no accounting for tastes, it is possible that some of the substances were such as were intended to please the demons, whose diet would naturally differ from that of human beings, and that they were offered as tidbits to placate them and to gently coax them out in the hope of getting "more." *De gustibus non est disputandum*, which in this case might be amended to *disgustibus*. Be this as it may, the medical aspect of such substances accounts for their being introduced likewise into ceremonies accompanying incantations as a means of exorcising the demons.[1]

The ingredients of the Babylonian-Assyrian "Dreckapotheke" are of the same order as the substances that go to compound the charm of the magic cauldron of the witches in "Macbeth."[2]

> "Fillet of a fenny snake,
> In the cauldron boil and bake:
> Eye of newt and toe of frog,
> Wool of bat, and tongue of dog,
> Adder's fork, and blind-worm's sting,
> Lizard's leg, and owlet's wing,
> For a charm of powerful trouble,
> Like a hell-broth boil and bubble.
>
> "Double, double toil and trouble;
> Fire, burn; and cauldron bubble.
>
> "Scale of dragon, tooth of wolf,
> Witches' mummy; maw, and gulf,
> Of the ravin'd salt-sea shark;
> Root of hemlock, digged i' the dark,
> Liver of blaspheming Jew,
> Gall of goat, and slips of yew,
> Sliver'd in the moon's eclipse;
> Nose of Turk, and Tartar's lips;
> Finger of birth-strangled babe,
> Ditch-deliver'd by a drab,
> Make the gruel thick and slab:
> Add thereto a tiger's chaudron,
> For the ingredients of our cauldron.
>
> "Double, double toil and trouble;
> Fire, burn; and cauldron bubble.
>
> "Cool it with a baboon's blood,
> Then the charm is firm and good."

---

[1] Examples in "Cuneiform Texts," xxiii, Pl. 4, 6, = Pl. 8, 40, hair of male and virgin goats, tail of kid; 17, 35, hoof of ox; and in the incantation texts where, as pointed out, substances of this character are frequently introduced.

[2] Act IV, i, lines 14-38.

These substances are not chosen haphazardly. Many of them were still in use in Shakespeare's days as medicinal remedies[1]—as survivals from the period when the aim of the healer's art was to drive out the demon. Others, like "scale of dragon" and "tooth of wolf," may have been amulets, but an amulet has also a medical aspect; it falls within the category of preventive medicine, a kind of inoculation against the demons. Medicinal drugs, charms and incantations are thus merely different phases of the same point of view, and there is, as a matter of fact, an unbroken chain connecting the use of such substances as a means of compounding a powerful charm, which in this instance gives the

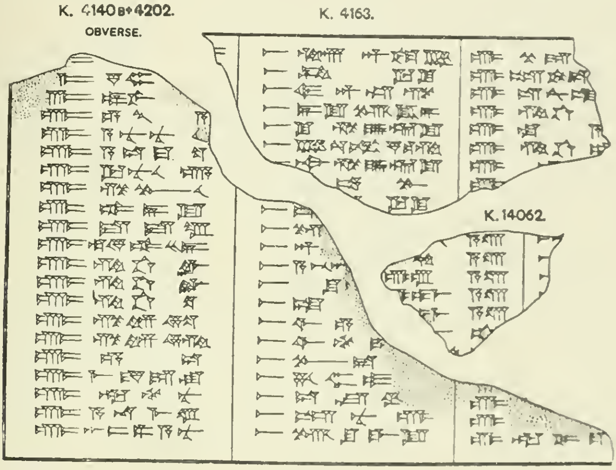

Fig. 14.

List of plants together with animal or human substances with which they are to be combined. ("Cuneiform Texts," xiv, Pl. 42.)

The first column gives the names of the plants, the second the animal or human substances. Thus the last line states that

Khaldappanu is to be used with a viper (mushshugallu).

Among the animal substances named are:

(1) Tail of a swine; (2) dog's neck; (3) foot of anzuzi (an insect), fat of a viper (mushkenu); (4) human anus—i.e., excrements of a human being; (5) human penis—i.e., urine.

---

[1] *See* Dr. Furness's interesting note on the mummy as a drug in the *Variorum Edition* of *Macbeth* (2nd ed.), p. 248 *et seq.* Mummy was used for gout, for epilepsy, and as a styptic. That the mummy was generally manufactured out of a dead carcase did not seem to interfere with the effectiveness of the drug. Dr. Furness quotes from Sir Thomas Browne's "Urn Burial," p. 28 (ed. 1658): "The Egyptian mummies which Cambyses or time hath spared, avarice now consumeth. Mummies is become merchandise, Mizraim cures wounds, and Pharaoh is sold for balsams."

witches the power to conjure up the future, with the "Dreckapotheke" of ancient Babylon. The latter as a phase of primitive medicine presents the double aspect of a means of ridding oneself of the clutches of a demon and of a series of ingredients for compounding a powerful charm in which formulæ and strange or disagreeable substances play an equal part—being capable of either casting a spell or of breaking it, according to circumstances. The incantation or charm is thus essentially a medical prescription, in which, however, the words of the medical formula are as significant as the prescription itself. The two in combination work the charm, and we have as a further instance of the persistence of early points of view the attitude towards medicine surviving in various parts of the modern East, where it is not uncommon for patients to swallow the medical prescription as well as the medicine prescribed. The physician's mysterious symbols are an incantation, and the medical compound is regarded merely as an accessory, though perhaps, a necessary one.

Lastly, before leaving the subject, let me call your attention to specimens of actual prescriptions[1] as further aids to the study of medicine. These specimens form, no doubt, part of an extensive dispensatory that may have covered a large number of tablets and which gave in some systematic sequence the prescriptions for the various diseases that were more fully treated in the medical handbooks. The form of the prescription is very simple, an enumeration of the drugs with the indication of the disease. Thus we have a prescription of eight distinct drugs for heart disease; another of five drugs to be compounded for *akkhhazu*,[2] and again six drugs for jaundice. In comparing the substances mentioned for the two latter diseases, it is of importance to note that they actually occur among the compounds mentioned in the medical texts.

It will have become apparent to you by this time that the chief problem besetting us at present in the study of Babylonian and Assyrian medicine is the determination of the hundreds of drugs that are found in the lists, and in the medical texts proper. The task is indeed a formidable one, because the names are generally written as ideographs, that is, with one or two signs representing the word. The ideographs themselves are often fanciful, as "dog's tongue," "fox-wine," "life-plant," "pestilence," and the like. It is only when the names are written, in the lists or in the texts phonetically, that is to say, spelt out by syllables, that we have a definite point of departure. At times the names reveal the character of the plant, but in most cases it is only if we can find a corresponding term in one of the languages cognate to Babylonian, such as Hebrew, Arabic, Syriac, and Aramaic that we can solve the problem involved. Now, fortunately, we have long lists of

---

[1] "Cuneiform Texts," xiv, Pl. 48 (Rm. 328); *see* fig. 16.

[2] Such prescriptions must be differentiated from texts which merely enumerate the diseases for which certain drugs are to be used, as K 14047 and Rm. 357 (Cuneiform Texts," xiv, Pl. 26 and 37), where in the first column the drug is mentioned, and in the second the ailment for which it is to be used. Thus five certain substances are entered in Rm. 357 as remedies for bowel complaints (*Ṭu*), for jaundice (*amurriḳanu*), &c.

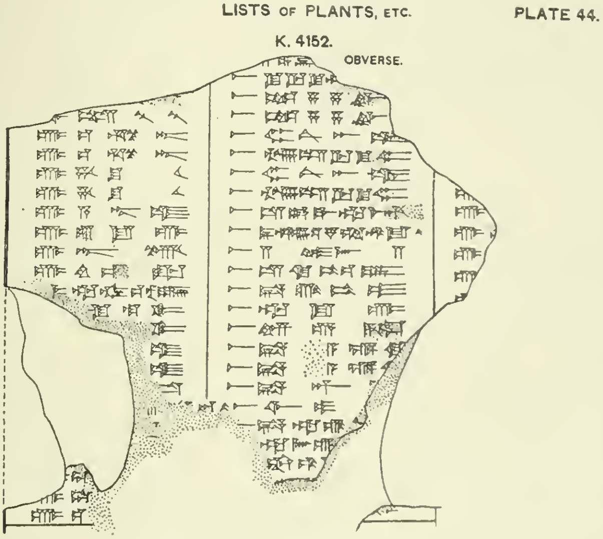

FIG. 15.

Another list of plants with animal, human, mineral, and other substances with which they are to be combined. ("Cuneiform Texts," xiv, Pl. 44.)

The left-hand column contains the name of the plants, the right-hand column the substances with which they are to be combined, e.g.:

Kukru (i.e., chicory) with a green frog.
Pestilence root with the ankle bone (?) of an ass.
,, ,, with the claw of a black dog.
Khashû plant with the ankle-bone (?) of an ass.
,, ,, with the claw of a black dog.
Atartum plant with earth from the outer gate.
Lillû with fat of a white pig.
Tarmush (bean ?) with fat of a white pig and rancid (?) fat.
Khi . . . herb, with dust trodden by a man.
Kamun (cummin) of tamarisk with gabi stone.

In the following lines several more stones are mentioned. The use of the sign for plant before a substance described as a part of the tamarisk tree again illustrates the extension of the sign for "plant" in the literal sense, to trees (which are usually introduced by the sign of "wood"), and no doubt to organic substances in general. Hence we find in these lists the same substance, sometimes introduced by the sign for plant or by the sign for wood, or by both.

medicinal herbs, plants, woods and roots in the medical literature of the Arabs.[1] Similarly, the Bible furnishes us with the native names for the most common trees and plants. Supplementary to the Bible we have the great compilation of the rabbis of Babylonia and Palestine known as the Talmud, and which reveals, incidental to discussions on questions of ritual, an extensive herbarium in Aramaic,[2] as well as other medicinal substances. Thirdly, we have medical compilations in Syriac literature, of which a most important and unusually comprehensive specimen has just been published by Mr. Budge, of the British Museum.[3] Though Syriac as well as Arabic medicine, and in part the medicine of the Talmud, are based on Greek models, and to a large extent form merely an adaptation of the great medical treatises of Hippocrates and Galen and their followers; still a considerable amount of the earlier native medicine survived both among the Arabs and the Syrians as well as among the Jews of the Talmudic age. This applies particularly to the names of plants, herbs, woods and roots, which would naturally be preserved in many cases in their native forms, though, on the other hand, many of the terms are of Greek origin. However, all that glitters is not gold, and not every drug that has been accepted as of Greek origin is really Greek. There are quite a number of instances of supposed Greek pharmacological terms which can be shown to be of Babylonian origin, and I venture to predict that further studies will strengthen the position that traces of the medicinal nomenclature of the Babylonian and Assyrian schools of medicine will be found in Greek medicine, which despite its advanced scientific form also carried over a portion of the legacy of an earlier age.

We may also expect to get some help from the important medical compilations of the ancient Egyptians.

Without desiring at this point to enter upon vexed questions as to the relationship of Babylonian to Egyptian medicine, we are, I think,

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[1] *See*, on the extensive medical literature of the Arabs, Brockelmann, "Geschichte des Arabischen Literatur," i, pp. 230-240, 482-494, and Leclerc, "Histoire de la Médecine Arabe," 2 vols., Par., 1876.

[2] Utilized by Löw in his great work on "Aramäische Pflanzennamen," Leipz., 1881; a mine of most valuable information from the medicine of the ancient and modern East. The medicine of the Talmud is admirably treated by Ebstein in his work "Die Medizin im Neuen Testament und im Talmud," Stuttg., 1903; Preuss, "Biblisch-Talmudische Medizin," Berl., 1911; see also "Die Medizin der Juden" in Neuberger and Pagel, "Handbuch der Geschichte der Medizin," i, pp. 110-118, now supplemented by Kraus, "Talmudische Archæologie," i, pp. 252-266.

"The Syriac Book of Medicines" (fuller title "Syriac Anatomy, Pathology, and Therapeutics; or the Book of Medicines"), 2 vols., Syriac text. English translation and elaborate introduction and indices; Oxford University Press, 1913.

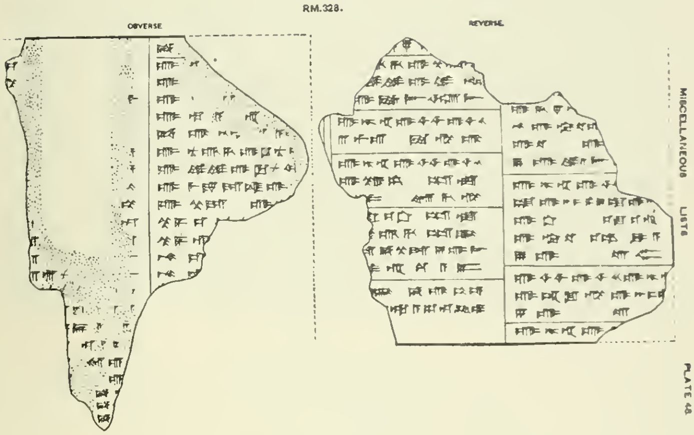

FIG. 16.

Specimens of medical prescriptions. ("Cuneiform Texts," xiv, Pl. 48.)

The obverse contains list of medicinal plants and stones, roots and seeds; the reverse a series of prescriptions, each placed in one of the divisions within the lines drawn across the tablet.

The first division of three lines to the left contains three drugs—Tarkhu, Shilim (darnel), Shiman—for an injury to the hands.

The second division of three lines contains five drugs to be compounded for *akhkhazu*, an advanced form of jaundice (above, p. 145). The drugs are again Tarkhu, Shilim, and Shiman with Karshum (leek ?) and Burashu (cypress).

The fourth division contains six drugs, including cypress, nulakhkha herb and mountain stone for *amurriḳanu*—i.e., jaundice.

The first division to the right contains nine drugs for a disease that cannot be determined owing to the defect of the tablet at this point.

The second division reads :—

> " Tarkhu, shi-[lim shiman].
> root of khaldappanu, root of tarmush (" bean " ?).
> supalu, fig . . . [another tree-fruit].
> White Ak, fox-wine.
> Nine drugs for heart disease."

The third division contains five drugs, also for some heart trouble, namely :—

> Shilim (darnel) shiman, Tar [khu]
> Alluzi, Khaldap[panu]
> Five drugs for the heart . . . .

(The specification of the kind of heart trouble is broken off.) Note the use of the sign for "plant" in the summary of the substances named—another indication that the sign is used in the very general sense of drug. We thus have, in the medical texts, three distinct usages of this sign: (1) plant in the narrower sense; (2) organic substances; and (3) drug in general—whether organic or inorganic.

quite safe in assuming that beneath the still unidentified hundreds of drugs in Babylonian and Assyrian medical texts and sign lists there lie concealed to a very large extent the same substances that have been fortunately identified in Egyptian texts.[1] We should therefore expect to find substances like aloes, acanthus, crocus, mastic, nasturtium, saffron, mandragora, pomegranate, and probably also absinthe and opium. Lastly, as a subsidiary source, the books in Pliny's Natural History devoted to plants and herbs and to medicine in general[2] are to be added, and which form a marvellous summary of the popular and scientific knowledge of the day, and incidentally embody notices of great value for Babylonian-Assyrian medicine. Through these various aids, Assyriologists devoting themselves to this special field of research will succeed in adding considerably to the number of identifications of the hundreds of drugs occurring in texts and lists. For some time I have been engaged in this work, and I trust ere long to publish the results of my studies in a technical journal. No doubt other scholars will in the immediate future also devote themselves to this task.[3] The interest of Assyriologists is now largely centred on the study of the Omen literature of Babylonia and Assyria, and this means that increased attention will be given within the next few years also to the medical literature as an offshoot of divination in combination with incantation practices.

VI.

Medical treatment among the Babylonians and Assyrians consisted, as we have seen, largely in the administering of drugs of a varying number of ingredients and tested substances of therapeutic value. Drugs, drugs everywhere, given in wine, or water, or milk, or oil, or in several of these substances. If this were all, our estimate of the medicine of Babylonia and Assyria would have to be summed up in the verdict that it had not passed beyond the range of treatment of disease, purely on the basis of popular experience of the medicinal value of

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[1] The three chief compilations of Egyptian medicine are: (1) the famous Papyrus Ebers, of which a new edition is being published by Wreszinski, "Der Papyrus Ebers," Leipz., 1913; a German translation by Dr. H. Joachim appeared in 1890; (2) the London papyrus (ed. Wreszinski; "Der Londoner Medizinischer Papyrus," Leipz., 1912); (3) "The Hearst Medical Papyrus," published by Dr. George Reissner (University of California Publications, 1905); and (4) the Berlin papyrus, published in 1909 by Wreszinski, "Der Grosse Medizinische Papyrus des Berliner Museums."

[2] Medicine in Books xxviii-xxx; botany scattered throughout Books xx-xxvii.

[3] Holma's investigations of Assyrian plant-names in his "Kleine Beiträge zum Assyrischen Lexikon," pp. 57-94, show the method to be pursued in this sphere of research.

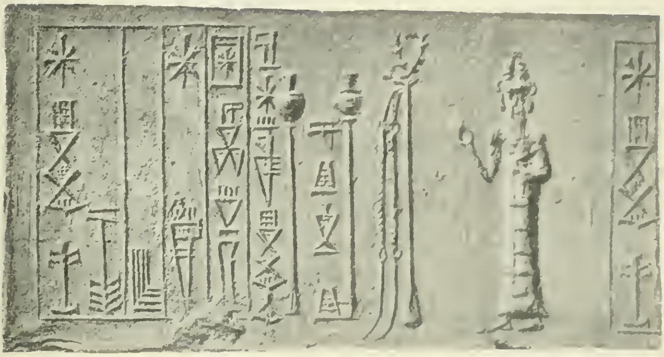

FIG. 17.

A seal of a Babylonian physician ; reproduced from De Sarzec, "Découvertes en Chaldée," Pl. 30 bis.

The seal cylinder was used in Babylonia and Assyria by all classes as a personal signature, attached to legal and business documents, which, it will be recalled, were written on clay. Herodotus, Book I, § 195, refers to this custom, and, in confirmation of the general use of seal cylinders, many thousands have been found dating from all ages of Babylonian-Assyrian history down through the period of Persian supremacy. These specimens, scattered throughout the museums of Europe and this country, and in private collections, often, though by no means always, contain the name of the owner, to which frequently a dedication to some deity or the indication of the status of the owner, or both, are added. The main feature of the cylinder, however, is the design, which is almost universally of a religious or semi-religious character—pictures of deities with worshippers being led into their presence, scenes from myths or from the Gilgamesh Epic, or based on mythological traditions, or symbols of the cult. A detailed and most careful study of the almost endless variety of designs has been made by Dr. W. Hayes Ward, "The Seal Cylinders of Western Asia," (Washington, Carnegie Institution, 1910). The material of which these cylinders—in the older period thick and oblong, in the latter periods tending to a cone shape—were made is as varied as are the designs: shell, serpentine, marble, aragonite, lapis-lazuli, chalcedony, jasper, crystal, carnelian, obsidian, &c.

The material of the physician's seal here reproduced is a light-grey limestone ; it is unusually large, 60 mm. high and 30 mm. in diameter. The inscription furnishes the name of the owner, Ur-Lugal-Edina—i.e., "the man (or devotee) of the god Lugal Edina," and there is added to the name the word *a-su* i.e., physician. Our physician dedicates the cylinder or himself to the god Edina-Mugi, whom he designates as the messenger of the god, Gir, which is a name or a form of the god of pestilence and death. The third line of the inscription contains some epithet of Gir which is not clear. Omitting this, the dedication reads:—

" (to) Edina-mugi
the messenger of Gir

. . . . .

Ur-Lugal-Edina
the physician, his servant."

Von Oefele sees in the two objects on the slender poles, cupping instruments, and Zehnpfund ("Beiträge zur Assyriologie," iv, pp. 220-26), following this suggestion, tries to find the word for "cupping instrument" in the accompanying inscription. All this is pure speculation, and Zehnpfund's reading of the inscription is quite impossible. As Ward properly suggests ("Seal Cylinders of Western Asia," p. 265), the two vases have the ordinary shape of such objects which are very frequent on seal cylinders. They may very well, however, represent part of the physician's outfit. Jars and cups of various kinds are frequently referred to in the medical texts, and we have long lists of all kinds of such utensils (e.g., V. Rawlinson, Pl. 41). The physicians would naturally need jars in which to keep and mix their drugs. Similarly the objects to the right of the second vase I take to be the physician's instruments. Two of them have all the appearance of knives, the third might be a mortar or a scalpel to crush and pound the stones, plants, and seeds used as drugs, or to spread the ointments and salves on cloth or leather.

Is there, perhaps, an unconscious touch of grim humour in the physician's choosing a deity who is the messenger of the god of pestilence and death as his patron?

certain plants, herbs, roots, juices, oils, salts, alkalis, and woods. We have, however, more than sufficient evidence in the medical texts that the "healers" of Babylonia, as well as their Assyrian colleagues, had advanced to the recognition of other forms of treatment. Let me in conclusion set before you some methods revealed in these medical texts. You may recall that[1] in extracts from texts dealing with stomach troubles, we encountered such directions as to place the patient on his knees so as to relieve the tension of the muscles of the stomach; or to place the head low and the feet high, so as to bring about a more even circulation of the blood. Such methods betray more than popular observation or popular experience, and rest upon some study of the reasons for the phenomena manifested in disease. To the same level belong the many references to the enema as a means of relieving the patient, and which has up to the present generally been supposed to be the discovery of the Egyptian physicians. We find the enema given both in a warm and in a cold form, and the frequency of such ingredidients as oil and honey clearly shows the aim of soothing the inflamed and irritated muscles, as well as the swollen fleshy portions. That the same mixture is ordered to be taken through the mouth and to be introduced into the anus[2] may strike us as perhaps naïve, but the logic of the treatment is irreproachable. The aim of the enema was to reach portions that could not be attacked through the mouth. If the remedy was a good one, it ought to work equally well, no matter in what way it was brought into the body. On the other hand, I am inclined to believe that the frequent injunction to sprinkle the patient with a mixture given as an enema is a reversal to primitive methods, with a view of exerting an influence on the demon rather than on the patient. In other words, the sprinkling is a ceremony of the same order as the sprinkling of the blood on the altar, or on the individual as prescribed in some of the codes in the Old Testament.[3]

Of a different character is the direction to rub the stomach with the mixture or to pour it on the anus, or both. A case of this kind is set forth in the following language[4]:—

> "If a man eats and drinks to his fill and then his stomach cuts him (i.e., he has cramps), and his insides are affected and swell up and has colic, he is suffering from *mushekinu*. To cure him take cedar bark,

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[1] *See* above, p. 131.

[2] E.g., K 191, &c., i, 30 (Küchler, "Beiträge, &c.," pp. 4-5).

[3] *See* above, p. 142.

[4] K 191, &c., ii, 17-20 (Küchler, "Beiträge," pp. 6-7).

> juniper bark, sweet reed (something like sugar-cane), *balluku*-herb, myrtle, *khaldappanu* (oleander), chop up these six substances,[1] add wine, heat the mixture, pour it off, add honey and refined oil; let it cool, rub it on his stomach and pour it on his anus."

Nothing could be clearer, and whatever the modern verdict might be with regard to the efficacy of such treatment, it will be admitted that the preparation and use of this liniment—for such it was—rests upon a rational basis. The ingredients, especially the oil and the honey, were expected to act as emollients to relieve the contracted muscles and to reduce the inflammation.

I have not been able to find any definite reference to the enema as a means of bringing about an opening of the bowels, though experience must have shown this to be one of the results. It was applied, so far as the texts go, for its soothing and healing effect, indicated by the general use of oil, which is so common as to warrant us in designating the oil treatment as one of the favourite remedies in Babylonian and Assyrian medicine for all stomach troubles. To give another example for the case of cramps and diarrhœa, the following remedy is prescribed [2]:—

> "If a man has cramps, his stomach does not retain food and drink, he brings it back through the mouth and he has vomiting spells, to cure him mix one half of a measure of dates (one half of a measure) of cassia, and add mint, and let him drink it fasting. Also prepare an enema of oil and introduce it into the anus, then his stomach will again retain food and drink, and he will recover." [3]

I have already had occasion to refer to the use of massage as an aid towards relieving pain in the stomach, and in passing we may note the frequent reference to the use of salts and of alkalis and of various other drugs, both as an aid in furnishing the digestive juices and to bring about an opening of the bowels. A typical instance is put briefly [4]:—

> "When a man's liver is affected mix cassia in water, let him drink it and he will have a passage."

Varying directions to effect the same end are added, such as [5]: (1) A large quantity of sweetened wine; (2) herbs in water; (3) salt to be taken either in water or wine; (4) chopped onions taken in water;

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[1] Text, "five," which seems to be a slip for six.

[2] K 71B, &c., iv, 43-44 (Küchler, "Beitrage, pp. 18-39).

[3] Indicated by repetition sign.

[4] K 61, &c., ii, 70 (Küchler, "Beitrage," p. 54).

[5] *Ibid.*, lines 71-73.

(5) *nukhurtu* plant and onions mixed together and taken in wine. Poultices, hot and cold applications, ointments and salves to be applied to various parts of the body are a further proof that the physicians of Babylonia and Assyria passed beyond the stage when medical treatment was limited to taking drugs inwardly, and that they must have developed at least some theory as to the reason for the relief to be expected through drugs externally applied.

There are many instances of directions to mix drugs into a paste, or a salve to be smeared on a cloth or on a bit of leather, and to be applied to some part of the body. A typical prescription for a head compress reads[1]:—

> "If a man has a burning headache affecting his eyes, which are bloodshot, take one-third of a measure of *sikhlu*, crushed and powdered, and knead with cassia juice, wrap it around his head, attach it (with a bandage), and do not remove for three days."

A more elaborate poultice for headache consists of the juice of seven plants mixed with wine, kneaded with cornflour into a paste to be spread on leather, wrapped around the head, attached, and to be kept there for several days. The directions are specific that the poultices are to be placed around the head and to be fastened with a bandage.[2] An interesting variation of the direct application is the direction to take certain kinds of clay, alkali, bone dust, rancid oil and fish oil, to mix together in a fire of thorns and to fumigate the head.[3] In the case of stomach troubles it would appear that the poultice was directly placed on the affected portion, though sometimes it was also spread on a cloth and firmly attached to a part of the body. A typical example reads as follows[4]:—

> "If a man's insides are affected take a half measure of barley flour (?), half a measure of crushed sesame, half a measure of *kibtu* flour, half a measure of chicory, half a measure of cypress plant: mix together with juice of cassia, knead it into a paste and apply."

Simpler poultices consist of half a measure of *sikhlu* and turnip seed kneaded with milk, spread on a cloth and applied to the stomach,[5] or of a measure each of two kinds of flour kneaded with wine, spread on a cloth and attached.[1] We may form some idea of the extent of the medical experience of the past gathered together in these texts, by noting that over a dozen different kinds of poultices are enumerated in connexion with pains and cramps in the stomach. In several instances directions are added to keep on with the poultices day and night,[2] which, of course, implies changing them from time to time. In the case of poisoning through a scorpion's bite a salve is prescribed composed of nine drugs, including two kinds of stones as ingredients (to be powdered, no doubt), the whole to be mixed together with cedar oil and then to be applied locally. As an alternative, a simpler salve, consisting of Shilim (darnel) mixed with oil is prescribed.[3]

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[1] "Cuneiform Texts," xxiii, Pl. 27, 12-13.

[2] A large variety of poultices are given in "Cuneiform Texts," xxiii, Pl. 26-33.

[3] "Cuneiform Texts," xiii, Pl. 26, 10-11.

[4] KK 71B, i, 11 (Küchler, "Beiträge," p. 14).

[5] *Ibid.*, line 20.

Lastly, and as a third indication of the more scientific aspects of Babylonian and Assyrian medicine, let me give you a few illustrations of the diet prescribed for the sick in cases of indigestion, in which the stomach refuses to retain food. The patient is to abstain from onions and leeks.[4] This precaution is frequently prescribed and is generally combined with the direction to wash in pure water or with the juices of various plants and herbs. Physicians did not, however, always agree, and so we come across a case of vomiting spells in which just the contrary is recommended, that for three days the patient should not wash (and abstain from onions and leeks), and, it is added, he will recover.[5]

A diet for stomach trouble in one instance appears to have consisted of two substances, one of which unfortunately cannot be determined owing to the defective condition of the tablet at this point, and the other is literally translated "the sediment of butter"[6] (can butter-milk be meant?). Another diet prescribed for stomach troubles consists of dates to be eaten in pig's fat, or in oil,[1] for swollen stomach with inclination to vomiting spells, onions with black cummin.[2] Again, in illustration of varying opinions among the physicians, we find a diet of green onions and chicory leaf to be beaten up in wine.[3] In quite a number of cases quiet and rest is prescribed, the terms reading: "Let him rest quietly," or again, "Let him lie down and keep quiet";[4] and you will have noticed the frequency with which it is specified that medicinal potions are to be taken "without food," that is, on an empty stomach, evidently with a view of giving the medicine a chance to have its full effect.

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[1] Line 16.

[2] KK 71B, &c., iv, 13, 19, 24, 26, and 29 (Küchler, "Beiträge," pp. 34-36).

[3] K 7845, obv. 4-13 (published by Fossey in *Zeitschr. f. Assyriologie*, xix, pp. 175-181, with further explanations by Frank in vol. xx, pp. 431-437. Attached to the prescriptions is a magic rite consisting of stringing nine stones on a cord of white wool and hanging them around the patient's neck. The remainder of the text deals with similar prescriptions against poison. In one case four drugs with which the patient is to be fumigated; in another, when the whole system is poisoned, no fewer than sixteen substances are enumerated, including twigs and seeds of tamarisk, seed of liquorice root, several thorny plants and weeds, the whole to be heated in fire—apparently with a view of burning out the wound.

[4] KK 71B, &c., iii, 17 (Küchler, "Beiträge," p. 28); also KK 191, &c., ii, 30 (Küchler, p. 6); also *ga-bi*, another variety of onion.

[5] *Ibid.*, ii, 38 (Küchler, "Beiträge," p. 24).

KK 191, &c., ii, 8 (Küchler, "Beiträge," p. 1).

Here I must rest my case, and I feel that I have kept you, as it is, beyond normal endurance. I should have liked very much to have touched upon the important question of the influence exercised by Babylonian and Assyrian medicine upon the ancient world. Briefly, let me say that the more direct traces of this influence are to be seen in the medicine of the Jews as revealed in the many passages of the Talmud in which medical treatment is discussed.[5] The Jews of Babylonia and Palestine naturally came under the direct influence of Babylonian and Assyrian civilization during the centuries (second B.C. to about the sixth A.D.) represented by the medicine in the Talmudic compilation, just as we find such striking proofs of this influence in the pages of the Old Testament covering the earlier periods—in the popular traditions, in the customs, in the laws and the literature of the ancient Hebrews. Despite the introduction of the more scientific methods of Greek medicine, the Jews clung to the Babylonian and Assyrian conception of disease as due to demoniac possession. We find incantations and magic rites in the Talmud[6] of precisely the same character as in the Babylonian and Assyrian literature, including even traces of a *Dreckapotheke*.[7] Such specific parallels as the frequent directions to take medicinal potions in wine[8] can hardly be mere coincidence. Indeed, I have no hesitation in saying that the medicine of the Talmud reflects at almost every turn Babylonian and Assyrian influences.[1] I do not feel competent as yet to pronounce a verdict on the relation between the Arabic and Babylonian-Assyrian medicine, not having reached this point in my studies, but it would be surprising if we should not encounter some traces at least of the methods and practices that were developed in the Euphrates valley, though of course the dominant factor in Arabic medicine is Greek science. The same is the case in Syriac medical compilations, which are largely based on Arabic models and follow the methods of Greek physicians. The recent publications by Mr. Budge of a most elaborate medical treatise of Syria to which I have already referred[2] places students in a particularly favourable position for studying the relationship of Syriac methods to Babylonian and Assyrian medicine. Let me at least point out that attached to the main Syriac treatise which proceeds methodically to treat one disease after the other and to discuss the symptoms after the manner of Greek medicine, the compiler has added a long section on astrology,[3] in which, as in Babylonian and Assyrian omen collections, are included prognostications as to the outcome and duration of the disease according to the day of the month on which an individual is taken sick, with a large variety of omens from the position of planets, from the winds, from the moon and shooting stars, from eclipses, lists of lucky and unlucky days, &c. It is hard to resist the conclusion that we have here a distinct trace of Babylonian and Assyrian divination practices, just as we may recognize the direct influence of Babylonian and Assyrian medicine in another large section added by the compiler, in which he has put together a most formidable array of remedies for all kinds of diseases and which he designates as "native prescriptions."[4] These remedies, enumerated as supplementary to those embodied in the main part of the work, are clearly survivals of the earlier stage of medicine prior to the introduction of Greek methods. We find, as a matter of fact, mixtures among these native prescriptions, as well as in the main body of the work, that remind us of those in the medical texts of Babylonia and Assyria. We come across the frequent direction to take the medicine in wine (though beer, as in Egyptian compilations on medicine, is also included). We find a considerable number of ingredients forming part of a *Dreckapotheke* which points to the survival of the endeavour to cure the patient by disgusting the demon, and we also have directions of a distinctly magic character. As a general point of resemblance between Syrian medicine and that of Babylonia and Assyria justifying us in seeking for further influences of the latter, I may instance the use of the Syriac word for heart, *lebba*, precisely as the Babylonian *libbu* in the medical texts for the "belly."[1]

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[1] *Ibid.*, line 11.

[2] KK 71B, &c., ii, 17, 18 (Küchler, "Beiträge," p. 22).

[3] KK 191, &c., ii, 10 (Küchler, "Beiträge," p. 6).

[4] KK 71B, &c., iv, 33 (Küchler, "Beiträge," p. 38).

[5] *See* Ebstein, "Die Medizin im Neuen Testament und im Talmud," and the other works above referred to, p. 164, note 2.

[6] *See* examples in Ebstein, *ibid.*, p. 170-180, and Blau, "Das Altjüdische Zauberwesen," Strassb., 1898.

[7] E.g., Ebstein, p. 178.

[8] E.g., Ebstein, p. 208.

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[1] My friend Mr. Israel Abrahams, of Cambridge, has called my attention to the account given by Josephus ("Antiquities," Book VIII, 2, 5) of the exorcising of demons in his day by a certain Eleazer, who drew the demons out of the bodies of the victims by means of certain roots attached to a ring placed in the nostrils of the victim. The basin of water which the demon, in passing out of the body of his victim, is supposed to overturn, is clearly some magic rite performed in connexion with the exorcism. Josephus refers also to the tradition that, among the powers possessed by Solomon, was that of effecting cures through forcing demons out of the body. In Josephus ("Wars," vii, 6, 3) there will be found an account of the root *baaras*, which has the power, if brought to sick persons, of driving away the demons supposed to be the cause of the ailment. The method there described of plucking out the root by tying the tail of a dog to it appears again to be part of a magic rite in connexion with the use of the drug. Such notices show the persistency of methods of curing diseases which form a perfect parallel to those of Babylonian-Assyrian medicine and unmistakably betray the influence of the latter.

[2] Above, p. 164, note 3.

[3] Budge, "The Syriac Book of Medicines," i, pp. 441-553 (translation ii, pp. 520-656).

[4] Budge, i, pp. 553-601 = ii, pp. 656-711.

The situation is quite different in the case of Egyptian medicine, which appears at an early period to have succeeded in cutting itself entirely loose from the bonds of incantations and magic rites. The Papyrus Ebers, dating from the sixteenth century B.C., and other medical papyri of about the same period are markedly free of all primitive notions. These compilations merit the name of being systematic treatises of medicine, passing from one disease to the other, according to a logical order. These hand-books set forth the symptoms and give the remedies, which reflect a far higher order of exact and scientific knowledge than is to be found in the medical texts of Babylonia and Assyria. And yet when we turn to the remedies and find such substances as dung, uterus and vulva of various animals included in the therapeutics, the conclusion is forced upon us that in Egyptian medicine also, the purpose of medical treatment, namely, the driving out of the demon as the cause of the disease, was not lost sight of. Such parallels, however, as may be observed between the methods of Egyptians and Babylonians respectively are not of such a nature as to justify us in assuming a borrowing on the one side or the other. It is quite natural to find milk, honey, oils, salts, cummin, cedar, cypress, and the roots and juices of leaves of other plants used in the Egyptian papyri, as in the medical texts of Babylonia and Assyria. If any connexion exists in the earlier periods we must assume the influence to be that of Egypt as the higher form upon Babylonia. In the later period of Egyptian history, however, the situation changes. Egyptologists seem to be united in asserting that in the time of the new kingdom and subsequent to this age magic and incantations reappear as factors in the treatment of diseases.

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[1] *Ibid.*, chap. xv, i, p. 267 = ii, p. 305.

If this is correct, then I have no hesitation in ascribing this recrudescence of primitive belief and practice to the spread of Babylonian-Assyrian divination throughout the ancient world, to which attention was directed in an earlier portion of this investigation.[1] Medical treatment in Babylonia and Assyria was so closely associated with divination as well as with incantation and magic rites that the spread of the latter would involve the influence exerted also by medical treatment beyond the confines of the Euphrates and Tigris.

Lastly, to say just a word on Greek medicine, it is clear that Babylonia had nothing to teach Greece which could have led to the great schools of medicine associated with Cos and Cnidos. It is probable that with the spread of Babylonian hepatoscopy, astrology and birth-omens into Greece (as into Egypt), some of the medicine of Babylonia and Assyria also travelled westward, but the influence could not have been pronounced. On the other hand, we have the testimony to Egyptian influence in Homer, who refers to Egyptian physicians. The occurrence of Egyptian herbs, of certain organic and inorganic substances in Greek medicine, likewise point to Egypt. With Hippocrates (c. 460-375), however, an entirely new era set in. The scientific spirit of Greece that had early manifested itself in the philosophical systems, in mathematics and astronomy, seizes hold of medicine and converts what had hitherto been a purely empirical study to a scientific one, based on principles that maintained their hold to the rise of the new medicine in our own days. In the popular remedies of the Middle Ages, on the other hand, which mark the return of methods the very reverse of scientific, and which survive as extra-medicinal elements of our own civilization, relegated to the root and herb doctors and to quacks of all kinds, we may see the continued influence of those ideas and practices which prevented Babylonian-Assyrian medicine from rising superior to its surroundings. But for this inherent weakness of Babylonian-Assyrian medicine we might have had in Mesopotamia a development that would have insured to the medicine of that country a worthy place by the side of that of Egypt, and which might have become the connecting link leading to the remarkable achievements of the Greeks. As it is, the credit for having exerted a direct stimulus on the Greek mind in this field belongs to the medicine as revealed in the Egyptian papyri.

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[1] *See* above, p. 126.

And now it only remains for me to thank you for the patience with which you have followed this endeavour to sketch in outline the course taken by Babylonian and Assyrian medicine, and to set forth some of its salient features. While we should be careful not to exaggerate the achievements of ancient civilizations, it is, notwithstanding, surprising to find that the Babylonian and Assyrian "healers" advanced as far as they did in the recognition of so large a number of specific diseases, in supplying these diseases with names, and in defining in many cases varieties of the same disease. Considering that, as I have tried to emphasize with special force, medicine remained attached down to the latest days of Babylonian and Assyrian history to the demon theory of disease, that incantation rites continued to be regarded an an important accessory to medical treatment, and that divination practices further held in check the free development of medical science, it is, I think, a rather notable achievement that the physicians of Babylonia and Assyria should have passed across the barren wastes of incantation rites and divination practices, and reached at least to the border of the promised land of pure genuine medical science. Indeed we may, perhaps, go a step further and assert, on the basis of the medical texts, and of the various aids to the study of Babylonian-Assyrian medicine, on the basis of the numerous prescriptions for poultices, for dressings, for massage, diet and rest, that Babylonian and Assyrian medicine, through some of its anonymous representatives, passed beyond the frontier and took possession of the outposts. The further steps in the invasion of the territory of true medical science were, however, left to others—to the Egyptians of an early age, whose medicine once stood on a far higher plane than that ever attained by Babylonian and Assyrians, and more particularly, of course, to the great Greek physicians of the fifth and fourth centuries before this era.

Let us, at all events, be grateful to the great King Ashurbanapal, who had the happy idea of preserving the legacy of past ages in his palace at Nineveh, and no less to the explorers who, amidst great difficulty, succeeded in rescuing so large a portion of this treasure; and lastly, to the scholars of England, of France, of Germany, of my own country and of other lands, through whose combined efforts we have been enabled to add a chapter to the history of human endeavours —endeavours that are none the less notable because bound up, as are all human achievements, with human errors.

Section of the History of Medicine.

March 4, 1914.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

Some Healing Wells and Waters, with a Suggestion as to the Origin of the Votive Offering.

By Dan McKenzie, M.D.

SUMMARY.

Introduction. Types and Classification of Well Cures: The Magical Group; Instances of the Religious Group; Instances of Semitic, Græco-Roman, &c. Water and the Genesis of Life. Rag Wells and the Votive Offering. Physical Water Cures: The Shock Treatment of Lunacy and Hydrophobia by Water. The Beginnings of Rational Hydrotherapy.

Introduction.

All the world over, and since the remotest antiquity, wells and waters have been employed in the cure of disease, and so to discuss the subject with any kind of thoroughness would, I fear, prove wearisome, if not unprofitable. Consequently, I intend to limit my attention solely to a few of its most interesting and attractive features, and for the same reason I will adduce in support of my arguments only a very small number of the available instances of well and water cures. Those who would like to study the subject in fuller detail are referred to the bibliography appended to this paper.

In beginning the study of folk medicine, the aspirant, if he wishes to avoid chaos, must remember that he is dealing with the practices of people whose mental processes do not follow the clear, simple lines of modern scientific reasoning, and he must try to adapt himself to a habit of thinking which, at first sight, may seem to him to be absurd and irrational. In this matter of folk cures, for example—and the same remark applies also to pre-modern orthodox medicine to a large extent—the therapeutic reputation of an article or substance by no means necessarily depends upon its physical or chemical properties. Nay, more than that—the therapeutic reputation does not even necessarily depend upon the therapeutic effect. For the curative principle in primitive medicine is, as a rule, something which transcends the sensible and material, and has a sublime indifference to mere results. Virtue, therefore, may cling about the most humdrum and prosaic things and places; whose exterior semblance may so belie their souls' immensity, that the water of a healing well may differ in no outward and visible quality from that of an ordinary cattle-trough. At the same time, while these remarks are perfectly true, they do not convey the whole truth, for a healing reputation may be attached to a well, and very often is attached to it, by reason of the very fact that its water does manifest some out-of-the-way extraordinary feature, if that feature is of such a kind as to evoke astonishment in the general mind of natural man. A most prolific mother of cures is Wonder! For, just as the mandrake, by reason of its fantastic shape—that "insane root that takes the reason prisoner" in a double sense—inflamed the imagination of our medical forebears more than did the other homelier herbs of the field, so, if the water of a well happens to be warm or unusually cold; if it bubbles or froths; if it is foul-smelling or purgative—then, in that peculiar characteristic, whatever it may be, there exists a special incentive to a belief in that water as a remedy for disease. In most cases this therapeutic reputation is general and applies to practically all diseases. In some instances, however, as we shall see, it is limited to certain diseases or to certain classes of patient; but when this is the case, the reasons for the limitation or selection have nothing whatever to do with the actual effect of the water upon disease, but are traceable to certain curious influences deep-rooted in the mental processes of early man. Here, as elsewhere in primitive medicine, the remedy does not come to fit the ailment—or to be dropped—until the chains of custom have been eaten away by the slow and uncertain action of secular experience, or, as is strikingly shown by the history of herbalism, until the application of scientific criticism reduces those chains to rust in the rapid course of one or two generations. In folk cures, however, just as in the therapeutics of early medicine, here and there we come across instances in which sound common sense and reason have played some part in guiding the wayward ideas of our predecessors. But those instances, however significant and important they may be from the germ they contain, are few in number and circumscribed in distribution. Lastly, with a natural and on the whole a quite justifiable disdain for consistency and for logic, our predecessors, both in the profession and out of it, had no difficulty whatever in reconciling in practice the two eternal opposites, rationalism and mysticism, and so we find water cures which are mystical; water cures which are more or less rational; and water cures which are mixed in their nature. I do not, however, intend to follow this classification in the present paper, as it presents certain inconveniences which might lead to confusion. Instead I propose to consider the subject under the following headings: First, the magical group of water cures; secondly, the religious group; and thirdly, the physical group. It is in the last that the small series of rational cures will be found.

THE MAGICAL GROUP OF WATER CURES.

The simplest and probably most primitive form of water curing is pure homœopathic magic. That is to say, the water is applied in order sympathetically to cleanse or purify the patient of his disease, the malady being wiped off him just as we wipe mud off our fingers. Magical laving is, as might be expected, most commonly used for skin and eye diseases. Of the former, ancient literature supplies several examples. We all have read the story of Naaman the Syrian whom Elisha bade wash in the River Jordan to cure him of his leprosy. I am aware that Hebra called Naaman's disease scabies, and that he summoned to the aid of his interpretation of the story the asphaltic or bituminous character of the river water. But we shall later on refer to other waters, quite devoid of any special chemical property, in which, also, leprosy was cured, so that if Naaman's disease was actually scabies, and if the River Jordan is bituminous, then Naaman was lucky, and so was Elisha.

Coming down to modern times we find that of the 129 healing wells in Britain described by R. C. Hope, the Quiller Couches, and others, sixteen are resorted to for skin disease, and, as you know, many of the patients who repair to Lourdes, and Holywell in Flintshire, are dermatological. The following are selected from British wells: St. Euny's well in Cornwall was believed "to have the property of drying humours and healing wounds and sores of various descriptions. But it is only at particular seasons that the tide of its virtues can be caught. The last day of the year is generally supposed to be more fortunate than any other, and at this time many resort thither to catch the holy impregnation." St. Cuthbert's well in the same county is set "in a dark cavern of the sea-cliff rocks, beneath full sea-mark on spring tides. The virtues of the water are, if taken inwardly, a notable vomit, or as a purgent. If applied outwardly, it presently strikes in or dries up all itch, scurf, dandruff and such-like distempers in men or women."

There are many reputed leper wells in Britain. At Middleton in Derbyshire, the Romans, we are told, were acquainted with a mineral well and here they built a bath. In the Middle Ages the tradition was still maintained and over the spring the Church erected a well chapel, dedicating it to St. Martin. And the story given out was that a Crusader, named Martin, afflicted with leprosy, having washed away his disease at this well, erected a chapel over it as a sign of his gratitude. In addition to skins, eye diseases are cured at wells. Here again we shall find the origin of the treatment in homœopathic magic. In sympathy with the crystalline waters of the spring, dim sight would be made clear, and the bleary eye transparent, while inflammations could be washed away just as skin disorders were.

There is another group of magical water cures which we may conveniently insert at this place, although, as a matter of fact, it depends upon an idea somewhat different from, though in principle closely related to, and even fundamentally identical with, that we have just been considering. In this group, diseases of all kinds are definitely transferred or transported to the water, and, as may be imagined, a running stream is of special value for the purpose, since it can carry the disease away beyond recall, like an autumn leaf on its surface. In certain parts of Britain thrush is transferred from a baby by passing through its mouth three rushes from a running stream, and then throwing them with their burden of disease into the water. You remember also in this connexion that Pepys alludes to the treatment of sciatica in Exmoor with the doggerel rhyme, recited by the patient at a river:—

"Bone-shave right,
Bone-shave straight,
As water runs by the stave
So follow bone-shave."

Folk-lore records are rich in transference cures to all kinds of objects—trees, bushes, rocks, and so on—indeed, they form a special class of folk cures, and so transference to water is only one of a large group of no special interest to us at the moment, as it happens.

In turning to discuss the

RELIGIOUS GROUP OF WATER CURES

we come to the largest and most interesting division of our subject. It is necessary, first of all, to make clear what is understood by the epithet "religious" in folk-lore. The authorities on the subject separate what may be called for the moment "superstitious" beliefs and customs into two classes, the magical and the religious. In the latter there is presupposed the presence in a natural object of some personality, some living being, more or less anthropomorphic in Nature. Thus if disease is cured at a well by virtue of the spirit immanent in the water, that we term a religious water cure, and the well a holy well. Indeed, well curing is only a phase of well worship. It must be remembered, however, that although the spirit may be moved to effect his cure either by supplication or by imprecation—he also can be compelled to exercise his gifts by the operation of magic, which, as Frazer has shown, is to the primitive mind of the same class of phenomena as the so-called laws of Nature are to the scientist.

Everywhere in the world the natural water in springs, wells, brooks, rivers, lakes, and in the sea, has been regarded as the outward and visible form and manifestation of indwelling spirits manifold in number, in name, and in character. And it is an interesting fact, as I hope to show later on, that these spirits and their waters have in the mind of the folk been intimately associated with the origin of life. The religious cults of holy rivers like the Nile, the Ganges, the Jordan, and the Tiber, are well known and require no special description. They stand in series with the river-gods of ancient Greece, one of whose images is in the Elgin marbles. To this day, devotees bathing in the Ganges are purified not only of sin, but also of disease, the offspring of sin. Wells, also, with their mysterious ebb and flow, their inexplicable appearance and disappearance, were under the control of mutable spirits who could both foretell the future and cure the diseases of those who flocked to them. There is, probably, no country in the world without its holy wells, all of them of immeasurable antiquity, reaching back as they do to epochs antecedent to the founding of the great world-religions. Everyone has read Burton's description of

Zem-zem, for example, the holy well of the mosque of the Prophet at Mecca, which is used both for ablution and for drinking, albeit that it is, or perhaps we ought rather to say because it is, "apt to cause diarrhœa and boils," and is "of a salt-bitter taste like Epsom salts." "It brightens the vision," like our ophthalmic wells nearer home, and, "it facilitates the pronunciation of Arabic to the student"—wherein it is unique. There can be no doubt that the vogue of this well antedated the Mohammedan religion, and that it was a holy well to the early inhabitants of Mecca, long before the birth of the Prophet, just as the St. Martin's well was esteemed sacred to the inhabitants of Britain before the arrival of Christianity.

The holy well of the Asklepian Temple seems to have been an invariable feature of the medical religion of Greece. Here it is believed the devotees bathed, mystically purifying themselves before they approached the deity. Caton says that at Epidauros "a deep well exists in the eastern Abaton. A stone dropped struck the water in a fraction over three seconds, as I found after repeated trials. The well is therefore 144 ft. deep. Possibly the water used in the ritual was derived hence, but perhaps the place of purification has yet to be found."

Inasmuch as the hygienic treatment at these temples involved hydropathic handling of a more scientific character, we may reasonably claim the Asklepian ritual as an example of the combination of mystical and rational treatment by water to which we referred in our introductory remarks. The Aesculapian well of the temple on the Island of San Bartolomeo at Rome is still in existence and is still resorted to by the Romans for the cure of disease. It occupies a prominent position in the middle of the altar steps of the existing church of San Bartolomeo. The font or curb of the well is a cylindrical structure of white marble bearing upon its facets rude effigies of certain of the saints. This structure dates from the twelfth century A.D. The church itself was, for the most part, built in the seventeenth century, although some of the columns in the interior are ancient. The open top of the font is guarded by an iron grating through which the rope is passed to draw the water, a procedure which, in the course of the centuries, has cut deep grooves in the inner lip of the parapet. The well is said to be 120 ft. deep, and it is still resorted to by the Romans for the cure of disease, as is shown by the presence in the church of votive offerings of arms, legs, &c. Its efficacy, unlike that of many of our British wells, is reputed to apply to adults no less than to children. The church is served by the Order of the Fate Bene Fratelli, and the monks, since remote ages, have been famed exponents in the art of pulling teeth. One of the brothers, recently deceased, made enough money by his dentistry to found an institute for the treatment of tuberculosis in boys. Thus the monks of San Bartolomeo are the spiritual descendants of the priest-physicians of Aesculapius, and, in a sense, the island of the Tiber may be regarded as one of the holy places of medicine.

There was another healing well in ancient Rome, the Lacus Juturnæ in the Forum, but, although a statue of Aesculapius with an acolyte bearing the sacred cock was found in one of the chambers in the building around the water-basin, the association of the Greek god with this particular well was probably an after-thought, originating in the open-hearted welcome which the Romans gave to all foreign deities. For the spirit of the well was the Latin nymph, Juturna, and that her reputation was pre-Aesculapian, and based upon folk-lore, is evident in the fact that the quadrangular stone water-basin contained a large collection of pins, coins, &c. It was the holy well of the primeval Roman village, reaching back like Zem-zem and St. Martin's well to ages antecedent to the arrival from Greece of the god of healing.

The Bible, also, has preserved for us an example of an ancient healing well in the account of the Pool of Bethesda, which, as it directly refers to the spirit of the water, I shall quote in full:—

> "Now there is at Jerusalem by the sheep market a pool which is called in the Hebrew tongue Bethesda, having five porches. In these lay a multitude of impotent folk, of blind, halt, withered, waiting for the moving of the water. For an angel went down at a certain season into the pool, and troubled the water; whosoever then first after the troubling of the water stepped in was made whole of whatsoever disease he had."

Sir F. Treves says:—

> "The pool of to-day is far down in the earth at the bottom of a pit delved out of a deposit of vague ruins. At the summit of the excavation, in place of a sheep-market, is a modern laundry with a corrugated iron roof, and around it a quite extraordinary number of stockings hanging out to dry. A stone stair, very steep and narrow, leads down the side of the pit and finally ends before a small cistern or reservoir, cut out of the rock and arched over by ancient vaulting. In the cistern, which could not accommodate a larger multitude than five or six, is water which would probably be condemned by any medical officer of health. This is the pool of Bethesda."

The Bible narrative shows several striking similarities to the beliefs which cluster around well worship and well cures in our own and other countries. Eye diseases were cured at the Pool of Bethesda; paralysis also, and for a peculiar reason which we shall examine in a moment. Finally, the tide of its virtues, like that of St. Euny's well, could only be caught at certain seasons. And obviously the "angel" which troubled the Pool of the Five Porches was none other than the autochthonous well-god, transformed by a later religion into a messenger of Jahveh, just as our native British well-gods assumed the style and standing of Christian saints after the arrival of the new religion. And the effect of his troubling the water refers to the belief, exemplified also in several modern British wells—e.g., St. Madron's well in Cornwall—that the water is most efficacious just after a freshet has flushed the feeding springs, a change denoted by the active welling or bubbling up of the water. The spirit is then most active.

Water and the Genesis of Life.

We have just seen that among the crowd gathered about the Pool of Bethesda there lay a multitude of impotent folk, halt and withered—in other words, paralytics. We now proceed to explain why it was that holy wells were of particular virtue in such cases.

Some years ago, in reading over the story of the cures practised at wells, I was struck again and again by the curious and unaccountable frequency with which children's diseases were treated at wells, and, before discarding the fact as being a pure irrational superstition—a highly irrational thing to do—I set to and made an extended investigation into the whole question, with the result that I found the reason in a curious interesting and quite connected group of beliefs. I will run over the subject quickly.

It soon became evident that the cure of children at wells could not be explained by any of the ordinary magical principles. Further, a wide excursion into the arid fields of religious ceremony showed that the well-curing of children had no connexion whatever with infant baptism, for that is nothing more nor less than the first bath of the new-born baby elevated to the dignity of a religious rite of purification or lustration. Consequently, I fell back upon the assumption that in the eyes of our forefathers children were in some mysterious fashion associated with the spirits of water. Following up the train of investigation to which this theory led me, I soon found that I had hit upon the truth. For there are stories, myths, beliefs, and ceremonies in great number and variety which bear upon the point and which, taken together, unite to form the opinion that in the mind of primitive man life came from water. Finally, I came to the conclusion that the whole of this great outcrop of folk-lore had its basis partly in the physiological fact that the intra-uterine life of the fœtus is passed in the liquor amnii.

It may be of some interest to you to mention a few of the ideas which grew out of this primal notion, especially as they have some bearing upon folk medicine and medical history. Of Poseidon, the Earth-shaker, were begotten not only Aphrodite, the lustrous daughter of the foam, but also the whole of the divine hierarchy of Greece, for in the "Iliad" he is called Θεωνγενέσειν (A. Wünsche). In ancient Mexico, children were sacrificed to the God of Rain. In the folk-tales of Germany the babies come into the world from rivers, marshes, ponds and wells. In some parts of the world barrenness in women is cured by bathing in certain holy wells, the water of which fertilized them. In ancient Greece, for example, the River Elatus in Arcadia and the Thespian well at Helicon enjoyed this reputation, and so did a well at Pyna in the vicinity of the Temple of Aphrodite. The Roman women used to visit a well near Pompeii for the same purpose, and we also hear of the practice in countries as widely separate as China, India and Algeria. In and around Jerusalem at the present day, according to Robertson Smith, there are a number of hot springs which are visited by childless couples, not for their medical properties, but because the djinn who produces the clouds of vapour is capable "in a definite and physical sense" of giving them offspring. In England also, there used to be a number of wells which were believed to cure sterility. Child's Well in Oxford, we are told, "by the holiness of the chapleyns serving there had virtue to make women that were barren to bring forth children."

Another offshoot of the same root-idea is to be seen in the ancient myth of the Water of Life. Without going fully into the ramifications and variations of this old-world story, I may remind you of the springs which had the miraculous power of restoring to the aged their long-lost youth. Poets have sung and painters have limned these wonderful waters, as well they might! I have here a photograph reproduction of Lukas Cranach's picture of the "Well of Youth" in the Königliches Museum at Berlin, in which are depicted large numbers of frail old women in wagons, in wheelbarrows, and the less weakly on foot.

coming to bathe in one of these springs of Eternal Youth. At one side of the pond they are delicately and timorously stepping down into the water, at the other side they briskly emerge—young, fresh, and engaging once more, and fully qualified to participate in the youthful delights that await them on the banks of this wonderful spring.

The whole collection of myths and customs inevitably leads to the conclusion that, in the ideas of early man, the well-spirit was in some way a creator of life. Here then we have the explanation not only of the belief that wells cured the diseases of children, but also that they cured paralysis, for that condition was, of course, regarded of old as a form of local death.

Rag Wells and the Votive Offering.

The point I am now about to discuss is that of the very common item in the healing ritual which consists in the hanging up of a rag or a small piece of the patient's clothing, generally on a tree or a bush near to the holy well—at some places so carefully observed is this part of the ceremony that the bushes around are constantly covered with a foliage of fluttering rags. What I believe to be a variant of the custom is the throwing of a bent pin into the water; or a coin is dropped in, as at the Fontana dei Trevi at Rome. That these customs are related to what we generally term the "votive offering" seems at first sight to be so obvious as to require no special emphasizing. But on closer inspection some doubts will arise. The chief difficulty lies in the fact that the votive offering, as we know it, usually assumes a form which shows that it is the fulfilment of a vow or the outcome of gratitude for benefit received. In the case of rags and pins, however, it is hard to believe that any deity would pleasingly accept presents of that kind. Evidently then we have here to do with some motive other than of gratitude. What that motive may be is, in my opinion, revealed to us by magical law.

In the variety of magical thought to which the term "telepathic magic" applies, the adept supposes that a permanent mystic link unites separated objects that have at some time or another been in contact with each other. To this class belong those beliefs which take the part as equal to the whole, the hair or nails as identical with the person from whom they were taken, the instrument for the wound which is inflicted, the footsteps for the man who made them, and so on. Apply this idea to the rag custom at wells, and in the wisp of fluttering cloth will be seen the medium of communication between the power of the well and the patient who left it there. As long as the rag hangs on the branch beside the well, so long does the patient actually and physically remain under the powerful curative influence of the water-spirit. As long as the pin lies in the water so long does the person who threw it in receive the benefit of bathing continually in its healing waters.

Turning now to the votive offerings usually met with, we find that these consist of an endless variety of objects, very hard to classify perhaps, but divisible nevertheless roughly into two groups, one of genuine offerings or tokens of gratitude and the other where the grateful motive is less easy to discern. In this latter group I refer particularly to images of diseased parts of the body—eyes, ears, limbs, goitres, and so on. These form, I suggest, like the rag or the pin at a well, a bond which serves to keep the patient and his diseased part eternally *en rapport* with the mystic emanation, the healing aura of the holy place. Thus the custom is, so to say, the obverse of charm or amulet wearing. In the one case the patient leaves his image or one of his belongings with the deity; in the other, the image of the deity or some other object suggesting the deity is worn by the patient. But the underlying belief in both cases is precisely the same. That the attachment of clothing was not limited to wells is evident from Pausanias, who mentions a statue of Hygeia at Titane which was "almost hidden under tresses of women's hair and strips of Babylonish raiment." And that the practice of leaving behind the image of the visitor at a shrine is not limited to medical deities is shown by the fact that in at least one of the temples in ancient Egypt the devotee when he left for home used to deposit his own image in the temple in perpetual adoration. And, as we have already seen, in Rome the coin in the Fontana dei Trevi unites the pilgrim eternally with the Holy City. Thus we may regard these objects as the earliest type of the so-called "votive-offering," and the group in which payment or gratitude dictates the offering as perhaps a later development coming into prominence as the belief in magic began to wane, a change which would certainly not be resisted by the priestly guardians of these holy places.

PHYSICAL WATER CURES.

From an early period in history recourse was had to water treatment of a more or less rational kind, arising as a result of the experience of the natural effect of immersion or bathing the patient in water, cold or hot. In this group, as has already been remarked, is to be found the embryo which later on develops into the hydrotherapy of modern medicine. Thus the cures in this group may be split up into (*a*) the physical treatment with an animistic purpose, and (*b*) the purely rational.

SHOCK TREATMENT BY WATER.

Everybody is acquainted with the shock treatment of disease by the savage medicine man, and with its rationale—how, when disease is ascribed to a demon, the expulsion of the intruder is engineered by measures adopted with the object of rendering his domicile as uncomfortable as art and malice can contrive. He is starved out, beaten out, or frightened out, and one of the instances of the last variety of maltreatment is the cold water plunge. The most interesting example of that cure is the immersion treatment of the wilder forms of insanity, a practice which has prevailed all over the world. (Perhaps I may say in passing that demoniac diseases as a class are acute conditions with delirium; diseases caused by magic are usually chronic.) In Sumatra lunatics are plunged into water and kept there as long as possible; next they are fumigated with burning feathers until they begin to cough; and finally, the demon's hold is broken by letting off a gun close to the patient's ear. In Cornwall the demon of mania was exorcized as follows: The frantic person was placed on the wall of a well with his back to the water. He was then by a violent blow on the chest suddenly knocked backwards into the well, where he was "tumbled about in an unmerciful manner until fatigue had subdued the rage which unmerited violence had occasioned. Reduced by ill-usage to a degree of weakness which ignorance mistook for returning sanity, the patient was conveyed to church and masses were sung over him."

The immersion treatment of insanity does not seem to have been practised by the regular physicians of Greece and Rome. At all events, I can find no mention of it in the writings to which I have access, but that it was practised by the laity of those times is probable, for Pausanias mentions a spring in Greece at which insanity was cured. By the doctors of the Middle Ages, however, both early and late, even when the humoral pathology was prevalent, this old antidemoniac method was employed. As recently as the times of Boerhaave (A.D. 1668-1738) the chief remedy for mania was to throw the patient into the sea and to keep him under water until he was nearly drowned. And in England about the same time John Wesley, that inveterate collector of domestic remedies, directs us to "Set the insane patient under a great waterfall as long as his strength will allow, or" (presumably when waterfalls were not easy to procure) "pour water on his head out of a tea-kettle."

THE WATER TREATMENT OF HYDROPHOBIA

comes into the class we are now dealing with. In the pathology of the world-folk and of our medical forefathers two different ideas concerning the nature of rabies are apparent. On the one hand there is the impression that in consequence of a dog-bite the soul of the patient is replaced by the spirit of a dog; a similar folk-belief is made use of by Kipling in one of his Indian stories. It is evidently to a variant of this belief that Paulus Aegineta is referring when he records that some people said that these patients dread the water because they saw in it the image of the dog that had bitten them. The other impression, which does not exclude the first, was that the demon of rabies has a horror of water. For this reason, Celsus and other Roman physicians plunged the hydrophobic into cold water, a practice which remained in vogue until quite recently.

RATIONAL HYDROTHERAPY.

The time at my disposal is too brief to permit of any more than a glance at this in many ways the most important branch of the subject. But my regret is modified by the knowledge that this branch of medical history has already received ample treatment. I shall confine myself, therefore, to giving a few examples of more or less sensible hydrotherapy among mature races. Among many uncivilized peoples the physical action of bathing is employed for diseases other than insanity and hydrophobia, and with more or less reliance upon actual physiological effects. The cold-bath treatment of pyrexia, for example, is practised by the Moquis Indians of California—often with fatal effect, the reporter caustically remarks. Hot bath, hot air, and other sweating cures are also quite common, all sorts of devices having been invented to induce perspiration. The Klamath Indians have a national dance which they keep up for five days, with the object, it is said, of curing disease.

The natives of Victoria, Australia, lay their patient over a hole dug in the ground in which a fire covered with wet leaves has been placed. Among the Indians of Guatemala vapour baths are frequently employed and behind their dwelling-houses small hemispherical ovens are erected for their provision. In like manner, according to Bancroft, vapour baths are popular among the Pueblos of New Mexico. Vapour baths are not infrequently resorted to in some countries to bring difficult labour to a speedy end. This is particularly the case in Russia, where every village possesses its "bath-hut," in which all the births take place, the woman going to the bath-hut as soon as her labour begins. This curious custom is believed to have its origin in the desire to avoid the contaminating of the dwelling-house by a taboo act, just as we know parturition was forbidden in the Asklepian temples. The same custom is alluded to in the Kalevala of Finland.

From beginnings such as these we may trace the development of the bath treatment in the Asklepian temples, and finally, of the great public bathing institutions of ancient Rome, and in the same way it is possible to see in the well cures of our villages the first foreshadowing of the extensive and trusted spa treatment of civilization and rational medicine at mineral and thermal springs.

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DISCUSSION.

Dr. GALLOWAY said that he was interested in hearing Dr. McKenzie's remarks respecting the healing wells of this country. He wished especially to emphasize the fact that the healing influence supposed to dwell in these waters, often personified as a local deity, retained traces of very early origin down to comparatively late times. Whether a Celtic race, or a race of Romanized or Teutonized Britons held the land, the ancient deity presiding over the spring could be distinguished in the various guises he assumed as the centuries passed on. Dr. Henry Barnes, at the last meeting of the Section, had drawn some attention to the healing wells which were in use in the great Roman settlement stretching from the Solway to the Tyne, sheltered by the wall. In several of the Roman stations along this line of settlement these wells existed. Within recent years there had been discovered during the excavations at Corstopitum a mould, giving the cast of a figure which may have been used as an ornament applied to decorative objects, or for the production of a tablet commemorating a local rustic deity. This mould was obviously used during the Roman period, but it showed little evidence that Græco-Roman artistic influences had affected the Romanized Britons of Corstopitum. It represents the figure of a bearded man, having a thick club in his right hand, resting on the ground, formed evidently of the twisted and gnarled branch of a tree. On the left arm was an oblong buckler with certain curious ornamentations—on the head a conical cap which probably had supported a plume. The clothing consisted of a tunic-like garment, fastened round the waist by a belt—the lower part, evidently formed of the skin of some animal, depended to the knees, suggesting the appearance of the kilt as worn in modern times. This human form, in its simplicity and rusticity of outline, must have represented ideas long preceding the Roman occupation and evidently still influencing the Romanized Britons who made it. A little farther west along the wall existed perhaps the most famous well of all, at Procolitia. The knowledge of this well remained as a tradition and actually had been described by Horsley nearly two hundred years ago. When excavated by the late Mr. John Clayton in 1875, it was found to contain perhaps one of the largest concealed hoards of Roman objects that had been discovered in this country. Thousands of coins of the Roman period, vases, pearls, "hand-altars," fibulæ, old shoes, were exposed to view, and many of these may have been votive offerings given by those who had benefited at the well. The goddess who presided and whose figure remains on certain of the votive tables was "Coventina." In this name there must be shrouded some much more ancient Celtic designation which had become thus Romanized. Procolitia was garrisoned by the first cohort of the Batavians, and their neighbours in the next station westward were the first cohort of the Tungrians, so that it is not to be wondered at that on one of the votive altars discovered the inscription reads, "To the Goddess Coventina; Aurelius Grotus a German";

and again another inscription which may be thus interpreted is to "To the Goddess Coventina, Titus Domitius Cosconianus, prefect of the first cohort of Batavians." Such wells and many others scattered through the country retain memories of mythical powers dating long before the Roman occupation, and continuing to exercise their influence through the Roman period down into much later times. Dr. Galloway hoped that Dr. McKenzie on some future occasion might take up this aspect of the subject, which he had thus suggested and give us the results of his observations.

Dr. F. PARKES WEBER said that in regard to the Roman coins which had been thrown into "healing wells" there could be no doubt that they represented votive or thank offerings. He had heard that the proportion of the plated pieces (forgeries of the period) to the genuine silver pieces in such "finds" was unusually high. In regard to bathing and cures at thermal springs in past times, it should not be forgotten that the time of immersion was very long, just as it still is in the ("prolonged") thermal baths at Leukerbad (Loèche-les-Bains) in Switzerland. Such baths produced maceration of the epidermis and violent cutaneous reaction, having a great effect in chronic psoriasis, &c.; and possibly in cases of scabies the acarus parasites were actually drowned by such methods.

Art and Epigram regarding Science and Medicine in relation to Death.

By F. PARKES WEBER, M.D.

"NEC SILET MORS" was the motto of the Pathological Society of London on its foundation in 1846—a motto which might fitly be applied to much recent scientific work carried out in connexion with Egyptian mummies, &c. Death, however much grief it causes, will often, if properly questioned, teach us something about the cause, course, and prevention of a disease, which may be helpful for the preservation of human life and health. The Cheselden and Bristowe prize medals of St. Thomas's Hospital, London, bear to some extent on this aspect of death, especially the former and more beautiful of the two, on which is the inscription, "Mors vivis salus." A medal of J. B. Morgagni (by T. Mercandetti, of Rome) has the inscription, "Saluti scientia," referring to his necropsy work.

The equally beautiful Fothergillian medal of the Royal Humane Society, London, may likewise be mentioned in this connexion, since a specimen struck in gold, now in the British Museum, was awarded in

1845 to Sir John Erichsen for his "Experimental Enquiry into the Pathology and Treatment of Asphyxia." This medal, like the above-mentioned Cheselden medal, was the work of William Wyon, R.A. (1795-1851).

Here also properly belong all medals commemorating life-saving scientific discoveries. I will only instance those made by Augustin Dupré (the foremost medallist of the great French Revolution), relating to Benjamin Franklin's discovery of lightning conductors, with the famous hexameter epigram: "Eripuit coelo fulmen sceptrumque tyrannis" ("He snatched the thunderbolt from heaven and the sceptre from tyrants"). With reference to a French translation of this epigram, Franklin is said to have written: "Notwithstanding my experiments on electricity, the lightning continues to fall before our noses and our beards, and as regards the tyrant there were more than a million of us engaged in tearing the sceptre from his hands."[1] The Latin epigram was first applied to Franklin by the French statesman Turgot (1727-81), and was probably suggested by a hexameter line (Manilius, *Astronomicon*, i, 104) relating to the influence of the teaching of Epicurus against superstitious fears. The indirectly life-saving discovery of how to produce anæsthesia (the "death of pain," as S. Weir Mitchell called it) for surgical operations is, I believe, commemorated by minor works of art as well as by some pictures.

Many paintings, drawings and prints relating to anatomical dissections and demonstrations, and dead bodies for anatomical or pathological examination, including Rembrandt's famous "Anatomical Lecture," old and modern portraits of Vesalius and others dissecting, or about to dissect or demonstrate, fall under this heading. A great number of famous dissection pictures (chiefly Dutch "anatomies" of the sixteenth and seventeenth centuries) are beautifully illustrated in the second edition of E. Holländer's "Die Medizin in der Klassischen Malerei" (Stuttgart, 1913, pp. 15-87). They help to illustrate the life-work of anatomists, physiologists, pathologists and anthropologists. An interesting contemporary painting in the Hunterian Library at Glasgow pictures John Banister (1533-1610) delivering the "Visceral Lecture" at the Barber-Surgeons' Hall in London, 1581.[2] There exist likewise various satirical or comical representations (including "initial letter" subjects, &c.) relating to anatomical demonstrations, dissections and post-mortem examinations.[1]

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[1] See *Brit. Med. Journ.*, 1914, i, p. 549.

[2] *See* D'Arcy Power, *Proc. Roy. Soc. Med.* (Section of the History of Medicine), 1913, vi, p. 19.

In this group I would likewise place the medals (bearing the device of human skulls) of F. J. Gall (1758-1828), the founder of the "phrenological doctrine," those of J. F. Blumenbach (1752-1840), the anatomist and anthropologist, and of the naturalist, Professor Karl Vogt, of Geneva (1817-95); and certain medals (with skulls or skeletons on them) relating to medical and allied sciences—for instance, the medals of the Company of Surgeons and the present Royal College of Surgeons of England, representing the story of Galen and the skeleton of the robber. The reverse of the original medal of the Company of Surgeons (1767) was made by Thomas Pingo, who, for that purpose, as Mr. T. E. James observed to me, evidently to a large extent copied the design of the frontispiece of William Cheselden's "Osteographia" (London, 1733). In Galen's time it must have been very difficult to get the opportunity of studying from actual skeletons—even at medical schools skeletons were rare, and it may be called to mind that Apuleius (the author of the "Metamorphoseon," or "Golden Ass" romance), who, like Galen, was born about 130 A.D., was accused amongst other things of possessing a skeleton—*for purposes of magic.* There was, therefore, some danger in possessing a skeleton in those days.

No medals have as yet been designed referring to death from the standpoint of the doctrine of the immortality of germ-plasm (August Weismann, &c.).

Various commemorative medals of medical men and their life-work, and medals relating to sanitation and public health, illustrate to some extent medical, sanitary and social attitudes towards death. Certain coins[2] of Selinus in Sicily (of the period *circa* 466-415 B.C.) may likewise be referred to in the same connexion, since their types commemorate the freeing of Selinus from a pestilence of some kind (malaria?) by the drainage of the neighbouring marshlands. They therefore illustrate a grand and public-spirited "hygienic" attitude towards preventible death from endemic infectious disease in the fifth century B.C. The spreading devastating epidemics of the dark ages of hygienic knowledge are abundantly illustrated in art, epigram and poetry. An engraving by the "Meister H. W.," dated 1842, of Death striding through the country, is apparently emblematic of such a visitation. This and a drawing of similar significance by Dürer, dated 1505, I have elsewhere alluded to,[1] but many other illustrations of the same kind might be adduced. For medals and medal-like tokens bearing on this subject the little work entitled "Pestilentia in Nummis," by L. Pfeiffer and C. Ruland (Tübingen, 1882), should be consulted. Very interesting are the medals, &c., on which fatal epidemics of plague and other infectious diseases are referred to as punishments or retributive calamities, visitations or manifestations of the Divine wrath on account of the wickedness of the people.[2]

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[1] Representations on old illuminated manuscripts of the removal of the heart or intestines from dead bodies previously to burial, may be mistaken for early pictures of post-mortem examinations.

[2] *See* F. P. Weber, "Aspects of Death in Art and Epigram," Lond., 2nd ed., 1914, pp. 222-224.

Acute epidemic diseases, such as plague, "cholera morbus," "typhoid" fever ("typhus abdominalis" of German physicians), "typhus" fever ("typhus exanthematicus" of German physicians), have been often represented emblematically as demons in works of art. Some modern weird and fanciful designs, representing the deadly power of infectious diseases, I have mentioned elsewhere,[3] and many others of various periods exist, especially in regard to cholera epidemics. In this connexion an amusing article is that by Dr. J. H. Alexander, in the *Medical Press* (London, 1913, vol. cxlvii, p. 229), headed "Are Micro-organisms the Demons of the Ancients?" He points out how strongly the facts now proved to be true about pathogenic and other micro-organisms resemble what was believed by the ancients to be true regarding demons, and what is still believed to be true regarding them by the superstitious of modern times in various parts of the world. Amongst their remarkable characteristics in common might be instanced: their universal presence, especially about decaying bodies and dark, damp, sunless places; their power of entry into living bodies; the minuteness of the space taken up by them; and their invisibility to ordinary eyes.

The ravages of more chronic infections and other diseases, such as tuberculosis, syphilis and cancer, have been similarly fancifully represented, and in this connexion it may be recalled that from Babylonian and Assyrian times (cf. Professor Morris Jastrow, jun., Lecture at the Royal Society of Medicine, London, October 10, 1913[4]), all kinds of diseases, but especially acute disease, were regarded as caused by demons.

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[1] Loc. cit., pp. 31-33, and fig. 5.

[2] Loc. cit., pp. 302-304.

[3] Loc. cit., pp. 84-90.

[4] *Proceedings*, p. 113.

Some violent, painful, non-infectious diseases, such as an acute attack of gout, have, like infectious diseases, been symbolized as a demon attacking part of the body—witness James Gillray's famous coloured print of the "demon of gout" attacking the ball of the big toe, one of the most popular of this caricaturist's works, published in 1799 by Mrs. H. Humphrey, at 27, St. James's Street, London. Amongst satirical representations of deaths from non-epidemic diseases, that by Ch. Aubry, 1822, entitled, "L'Apoplexie foudroyante" (a bloated-looking, thick-set man, stretched out on a couch in the dining-room), may specially be noted.[1] This may be compared to Grandville's design[2] of the apoplectic-looking baron after his good dinner, telling his servant to say that he is "not at home" to a visitor (Death), who is, however, entering the room without waiting for permission. (This design seems to have inspired one of Death being asked to "come in," by Willibald Krain, in *Jugend*.) Alfred Rethel has pictured Death, as a cook, in the kitchen of a rich gourmand's house. Hogarth's "Gin Lane," and "La Vice Suprême," by Félicien Rops, should also be mentioned.[3]

Certain medals[4] relate to the sanitary disposal of the dead—e.g., to the cremation of corpses and to the prohibition of burials within cities and towns or inside churches and other closed buildings. A not uncommon device which relates to medical work is that of a skeleton-like figure (representing Death or Disease) being withheld or driven back as the result of hygienic work or medical skill and devotion; for instance, the obverse design on the military-like medals awarded to all those who helped in sanitary work, &c., during the epidemic of bubonic plague in Hong-Kong, 1894. Similarly, Æsculapius is represented warding off a figure of Death on a medal commemorating the epidemic of cholera in Paris, 1832. The device on certain medals of the Royal Humane Society, London, is much more pleasing. A child is pictured endeavouring to rekindle a torch with its breath, and the accompanying inscription is "Lateat scintillula forsan." Many of the great advances in medical knowledge and surgery in opposing disease and unnecessary death are commemorated or alluded to on medals (there is, for instance, a medal recording the recent triumph of Paul Ehrlich and S. Hata) and minor works of art; but, to take one instance alone, the account of the medals relating to Edward Jenner and the discovery of vaccination would use up more space than I have the command of. Such discoveries and, especially, the modern scientific and practical work of Pasteur, Lister, Koch, Ehrlich, E. von Behring, Ronald Ross, Patrick Manson, W. C. Gorgas, &c., have helped Medicine to climb the lowest rungs of the endless ladder of progress, and have encouraged the application of cheering lines from Arthur Hugh Clough's well-known poem, "Say not the struggle nought availeth," to the steadfast hope and striving advance of the still very youthful sciences of Hygiene and Therapeutics.

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[1] *See* Holländer, "Die Karikatur und Satire in der Medizin," 1905, plate iii.

[2] *See* F. P. Weber, loc. cit., p. 89.

[3] *Ibid.*, pp. 86, 87, 89.

[4] *Ibid.*, pp. 314, 325, 326.

To my mind the life-saving progress of the medical sciences should be symbolized by the *infant* Hercules in his successful struggles, rather than by the frequently repeated device of the *adult* Hercules attacking the Lernean Hydra. In this connexion one naturally thinks of Sir Luke Fildes's beautiful and very popular picture of "The Doctor" (1892). For the description of medals of medical interest, I would refer especially to the writings of Dr. H. R. Storer, in the *American Journal of Numismatics* and elsewhere.

I have referred elsewhere to medals relating to the saving of life at great personal risk and to death for the sake of medical duty or medical investigation.[1] But for the ordinary medical man "Aliis inserviendo vivo" is surely as good a motto as "Aliis inserviendo morior" or "consumor" (the motto of Tulpius, whose features Rembrandt's art has made familiar).[2]

Here, perhaps, may likewise be mentioned the gem-stones (often engraved with special devices), the finger-rings, the coins, the coin-like tokens, the medalets and medals, and the talismans and amulets of all kinds, which, at various times and various parts of the world, have been worn, and even nowadays still are carried about the person or somehow employed as supposed means of prevention—as "charms" to ward off disease, the effects of poisons, accidents, the "evil eye," and death. A description of all the objects which have been used for supposed protection against the "evil eye" would alone take up too much space; and amulets of this class are still employed by ignorant peasants of Italy and the South of Europe—vide S. Seligmann, "Der böse Blick," two volumes, Berlin, 1910. On this whole subject *see* also "The Evil Eye," by F. T. Elworthy, London, 1895, and "Horns of Honour and Other Studies," by the same author, London, 1900. In the last-mentioned work special information is given in regard to antique "symbolic hands" and the curious terra-cotta "magic" or "sacred" disks met with in many museums of Greek and Roman antiquities. The "symbolic hands" are amongst the most interesting "magic" objects which were supposed to serve as a protection against the "evil eye"; they are always covered over with the attributes of deities and other symbols. Amongst the Greek and Roman antiquities in the British Museum, arranged to illustrate the daily life of the ancients, there are fine specimens in bronze of such "symbolic hands." Phallic and other "charms" worn by women desirous of becoming mothers constitute of themselves a large minor class, and their use has not yet been altogether given up. The New Zealand Maori charms, called "Tikis," of bone or finely polished green jade, with inset circles of mother-of-pearl for the eyes, are some of the most curious of amulets from the collector's point of view. Occasionally a special virtue has been popularly attributed to certain coins, and they, like "cramp-rings" (finger-rings sometimes made out of old coffin-nails, &c.), have been worn as charms against cramp, epilepsy and convulsions.[1] We need scarcely here allude to the gold "angels" and their connexion with the royal ceremony of "touching for the king's evil" in England, or to the so-called "touch-pieces" which afterwards replaced them.[2]

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[1] Very interesting in this connexion, though of doubtful significance, are the medals on the death of Dr. Wenzel Beyer of Karlsbad (1526). *See* F. P. Weber, loc. cit., pp. 245-248; *see* also *ibid.*, p. 170.

[2] N. P. Tulpius (1593-1678), physician and Burgermeister in Amsterdam, whose portrait is so well known nowadays owing to Rembrandt's famous picture (1632), called "The Anatomical Lecture" (Hague Picture Gallery), had as a motto, "Aliis inserviendo consumor"; it is inscribed on his portrait by N. Elias, in the Six Gallery, Amsterdam. This motto occurs also on coins of Julius, Duke of Brunswick-Wolfenbüttel (1568-89).

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[1] In England, in the seventeenth century, there was a special *office* (ecclesiastical) for the consecration of "cramp-rings."

[2] For medals, coins, and coin-like tokens used as amulets, talismans, or charms against the plague, cholera, and other deadly epidemic diseases, accidents in travelling, &c., see the section, "Auf Pest und pestartige Krankheiten und deren Abwehr geprägte Medaillen, Jetons, &c.," in "Pestilentia in Nummis," by L. Pfeiffer and C. Ruland, Tübingen, 1882, pp. 73-126; also the section on cholera, *ibid.*, pp. 153-69. Amongst the best-known pieces of the kind are the various so-called "Wittenberger Pestthaler" of the sixteenth century, with Moses' brazen serpent on the obverse and the Crucifixion on the reverse; some of these Pestthaler were perhaps really made at Joachimsthal, the flourishing mining town of Bohemia. The series of St. Benedict amulets, or "Benedicts-Pfennige (cf. F. P. Weber, loc. cit., pp. 301-02) are likewise very interesting. The earliest pieces are doubtless of the seventeenth century, but the type has been more or less preserved to modern times on medalets sold to credulous pilgrims at various popular shrines of Southern Germany and Switzerland. *See* also [Karl Domanig, "Die Deutsche Medaille," Vienna, 1907, plates 92 and 93, for figures of "Georgsthaler," and pest-medals and amulets of various kinds.

A Greek bronze coin of Laodicea, in Phrygia (136 to 138 A.D.),[1] which I presented to the British Museum, had in ancient times been pierced and furnished with a bronze ring for suspension, probably to be worn as a "charm" against sickness or death, on account of the figures of Asklepios and Hygeia represented on the reverse.

Strictly speaking, an *amulet* was supposed to protect the possessor, whilst a *talisman* gave him some magical power (like the lamp and ring of Aladdin in the "Arabian Nights"), but the two terms have become practically synonymous.

In regard to antique and mediæval talismans and amulets of all kinds, against the "evil eye," diseases, &c., *see* also C. W. King's volume, entitled "Early Christian Numismatics and other Antiquarian Tracts," London, 1873, pp. 173-247. On p. 202 King narrates a remarkable story regarding one kind of "medical" amulets: "Ismayl Pasha, son of Mohammed Ali, on his return from his expedition to Meroë, took up his quarters with a small guard in a hut at Chendy, Sennaar, imagining the country quite reduced to subjection. But Nimir, the former king, came by night, placed combustibles round the hut, and consumed it, with all those inside. The guard was cut to pieces by these Nubians, with the exception of the pasha's physician, a Greek, who was carried off for the more evil death. His captors drew out all his teeth, which they divided amongst themselves to sew up in their *grigri* bags, it being their firm belief that whosoever carries about him the tooth of a physician (drawn whilst *living*) secures himself thereby from all diseases for all time to come." The kind of African amulet termed a *grigri*, *greegree*, or *griggory*, is generally a little leather bag enclosing passages of the Koran or other charm-like objects. One grigri is supposed to protect the wearer from shot, another from poison, another from venomous beasts, another from evil spirits and witches, and so on.

On p. 316 of the same work King adds the following interesting note regarding another kind of "medical" amulet: "Mightily esteemed during the Middle Ages as a prophylactic against all disease was the *Sign of Health*—the 'masonic pentacle,' or *Solomon's Seal*, having in each of its exterior angles one of the letters of the word SALVS, thus arranged for the sake of mystery: V.A.L.S.S. It became the badge of the medical profession, and was regularly carried by physicians engraved on their rings. A grand example of the fashion I observed in that treasure-house of similar rarities, the dactyliotheca of Mr. Octavius Morgan, a gold ring of extraordinary weight, bearing the life-giving symbol elegantly engraved in a circle formed by the coiled serpent of the god of health. Marguerite de Valois adopted this for her device, perhaps induced by the analogy of the word to her own family name."

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[1] Described by Mionnet, "Description de Médailles Antiques Greeques," Par., 1807-37, iv, No. 743.

On Mithraic and the various classes of Gnostic amulets and talismans, *see* Franz Cumont, "Textes et Monuments figurés relatifs aux Mystères de Mithra" (Bruxelles, 1899), and his "Die Mysterien des Mithra" (German edition by G. Gehrich, Leipzig, 1911); and C. W. King, "The Gnostics and their Remains," second edition, London, 1887. Especially interesting is King's account (op. cit., p. 195) of the explanation of the mode of action of the "evil eye" or the "envious eye," as given in the "Aethiopica" (iii, 8) of Heliodorus, in a passage which is likewise interesting with regard to theories current at the time (fourth century A.D.) on the communicability of infectious diseases: "The air which surrounds us passing through the eyes, as it were through a strainer, and also through the mouth, the teeth, and the other passages, into the inward parts, whilst its external properties make their way in together with it—whatever be its quality as it flows in, of the same nature is the effect it disseminates in the recipient, so that when anyone looks upon beauty with envy, he fills the circumambient air with a malignant property, and diffuses upon his neighbour the breath issuing from himself, all impregnated with bitterness, and *this*, being as it is of a most subtile nature, penetrates through into the very bone and marrow. . . . Consider also, my Charicles, how many people have been infected with ophthalmia, how many with other pestilential diseases, not from any contact with those so affected, or from sharing the same bed or same table, but merely from breathing the same air. . . . And if some give the stroke of the Evil Eye even to those they love and are well disposed towards, you must not be surprised, for people of an envious disposition act not as they wish, but as their Nature compels them to do." Even amongst non-superstitious moderns the "evil eye" (in the form of a disagreeable "stare") has sometimes been potent enough to produce death (by a duel!) The old saying, "A cat may look at a king," should not be acted on when persons pathologically sensitive to being looked at ("ophthalmophobia") are concerned.

The medical profession has always been and will always be peculiarly exposed to satire, because it struggles against disease and death, and because death, by the inexorable laws of Nature, must in every case, sooner or later, win the battle. The old proverb, "Physician, heal thyself" (St. Luke, iv, 23), is indeed unanswerable, for in the end Death always comes for the physician himself, as he is represented doing in the various famous "Dance of Death" series. In reality, however, St. Luke's *Ἰατρὲ θεράπευσον σεαυτόν* only meant, "Physician, *treat* yourself," like the Vulgate version, "Medice, cura teipsum." (Similarly, the saying, "Medicus curat, Natura sanat," means, "The physician treats—*cares for;* Nature heals—*cures.*")[1] In regard to the physician being fetched by Death in the various "Dance of Death" series, an anonymous Dutch engraving of the seventeenth century may be mentioned, in which Death is depicted conducting a sick man to have his urine examined by a doctor (as in one of the Holbein woodcuts), but Death has doubtless come for the Doctor himself. In a "Dance of Death" scene, engraved by Zimmermann in a Swiss almanac, Death brings his urine to the doctor for inspection, whilst in the "Totentanz" (where the physician is pictured wearing eye-glasses), printed by Jacob Meydenbach, at Mainz, in 1491, and in the "Danse Macabre," by Cousteau, published by Antoine Vérard in 1492, and in some other series, Death calls for the doctor just as the latter is engaged in inspecting a flask of urine; in a French eighteenth-century series (1788) the doctor lets the flask of urine fall to the ground when Death catches hold of his coat.

As Shakespeare ("Cymbeline," act v, scene 5) says: "By medicine life may be prolonged, yet death will seize the doctor too." Hans Sachs, the "Meistersänger" of Nürnberg, in his poem, "Der Tod ein End aller irdischen Ding," describes the position of medicine towards death at somewhat greater length. He makes the Healing Art say:—

> "Ich bin nur ein Hilf der Natur,
> Die Krankheit zu arzneien nur.
> Wo Glück mitwirkt, da hab ich Kraft;
> Sunst hilft kein Fleiss noch Meisterschaft."

We need not here allude to all the proverbs, epigrams, epitaphs, witty tales, and cheap jokes of the "chestnut" kind—ancient and modern—that exist in dispraise of the doctor. They mostly hint at the cure (i.e., "cura" = treatment), or the doctor, being as bad as, or worse than, the disease ("Pessimus morbus est medicus"—so, also,

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[1] A favourite phrase in the writings of the famous French sixteenth century surgeon, Ambroise Paré, was: "I treated him, God cured him."

"Young doctors kill their patients, and old doctors allow them to die"),[1] and suggest that the doctor sometimes, from ignorance or carelessness, does more harm than good, and thus unwittingly plays into the hands of Death. We have the modern epitaph on the quack doctor whom Charon did not wish to ferry across the Styx, because in the upper world he was so useful in sending down passengers for Hades ("Nugæ Canoræ," by the London surgeon, William Wadd, 1827, epitaph 55):—

> "This quack to Charon would his penny pay:
> The grateful ferryman was heard to say—
> 'Return, my friend! and live for ages more,
> Or I must haul my useless boat ashore.'"[2]

A similar German epigram by G. E. Lessing refers to Laïs and other beautiful courtezans, and to physicians, as being all of them too useful to Death to be allowed to die young.

Martial's satirical epigrams (for excellent English versions of most of Martial's epigrams relating to medicine, *see* Raymond Crawfurd's recent paper) on "Diaulus" (book i, 31 and 48), on an oculist who became a gladiator (book viii, 74), and on Hermocrates (book vi, 53), are typical examples of the kind—

> "Chirurgus fuerat, nunc est vespillo Diaulus:
> Coepit quo poterat clinicus esse modo."
>
> "Nuper erat medicus, nunc est vespillo Diaulus:
> Quod vespillo facit, fecerat et medicus."
>
> "Hoplomachus nunc es, fueras ophthalmicus ante.
> Fecisti medicus quod facis hoplomachus."
>
> "Lotus nobiscum est, hilaris cenavit, et idem
> Inventus mane est mortuus Andragoras.
> Tam subitæ mortis causam, Faustine, requiris?
> In somnis medicum viderat Hermocratem."

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[1] Compare, farther on, the difference made between allopathy and homœopathy.

[2] This uncomplimentary epitaph was doubtless suggested by the very complimentary lines on a physician, by Lucilius, or by similar lines on various physicians, in the "Greek Anthology." An English translation from Lucilius is given in H. P. Dodd's "Epigrammatists," Lond., 1870, p. 50:—

> "When Magnus passed below, Dis, trembling, said,
> 'He comes, and will to life restore my dead.'"

This Magnus was probably a physician at the Roman Imperial Court. J. D. Rolleston, *Proc. Roy. Soc. Med.* (Section of the History of Medicine), 1914, vii, p. 8, quotes three epigrams from the "Greek Anthology," illustrating this idea of the physician depopulating Hades. The first ("Anth. Graec. Plan.," 270) is an epigram by Magnus (? the above-mentioned physician) on a statue of Galen: "There was a time when, thanks to thee, Galen, the earth received men mortal and reared them up immortal, and the halls of Acheron were empty owing to the power of thy healing hand." The second is an epigram by an anony-

This last one (cf. the similar epigram by Lucilius, "Anth. Graec." Tauchnitz edition, xi, 257) is outdone by the Greek lines which have been attributed to Nicarchus ("Anth. Graec.," Tauchnitz edition, xi, 118) on a (doubtless imaginary) doctor named Phido ("drawing-room equivalent" given in Dodd's "Epigrammatists," 1870, p. 52)—

> "Phido nor hand nor touch to me applied ;
> Fever'd, I thought but of his name—and died."

Amongst the many epigrams in dispraise of physicians or quacks cited from the "Greek Anthology" by Dr. J. D. Rolleston[1] are several which bear on the present subject. An anonymous epigram ("Anth. Graec.," Tauchnitz edition, 1829, xi, 125) describes a compact between a doctor and a gravedigger, whereby the gravedigger supplies the bandages stolen from the corpses, in return for which the doctor sends all his patients to the grave. An epigram of Nicarchus says (*ibid.*, xi, 115): "If you have an enemy, Dionysius, don't call down on him the wrath of Isis, nor of Harpocrates, nor of any god that makes men blind, but invoke Simon, and you will learn what a god can do and what Simon." Two epigrams (Rolleston writes) allude to artistic tastes combined with the swift dispatch of patients. One is by Nicarchus (*ibid.*, xi, 113): "The physician Marcus touched the statue of Zeus yesterday, and though it is stone and Zeus, it has gone to-day (like his patients)." The other is by Ammianus (*ibid.*, xi. 188): "Nicetas when he sings is an Apollo of song, and when he practises medicine he is a slayer [there is a pun in regard to the Greek word ἀπολλύων meaning *slaying*] of his patients." Palladas (*ibid.*, xi, 280) describes the surgeon Gennadius as one who, after exacting his fee, conducts his patients to Hades. Rolleston states further that the readiness and impunity with which physicians and surgeons have been said to kill their patients (a favourite theme for the satirist throughout all ages) are exemplified in many of the Greek epigrams. The mere touch ("Anth. Graec.," Tauchnitz edition, 1829, xi, 114), sight (*ibid.*, 123), thought (*ibid.*, 118), or dream (*ibid.*, 257) of

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mous writer ("Anth. Graec. Append.," Tauchnitz edition, 1829, 119) at the end of an hexameter poem on Asklepiades: "The physician Asklepiades has gone to the home of the blessed, and has left desolation and solitude among the dead." The third epigram is by Crinagoras on the statue of Praxagoras ("Anth. Graec. Plan.," 273): "The son of Phœbus implanted in your breast, Praxagoras, the knowledge of the healing art. All the ills which arise from long fevers and the balms to place on the wounded skin, thou has learnt from his gentle wife, Epione. If mortals had a few physicians like thee, the barque of Charon would not have to cross the Styx."

[1] *Proc. Roy. Soc. Med.*, 1914, vii (Section of the History of Medicine), pp. 3-13.

the doctor was said, in satirical epigrams, to have proved fatal. Lucilius, for instance (*ibid.*, 257), wrote: "Diophantus saw the doctor Hermogenes in a dream, and never woke again, although he wore an amulet" (? an amulet against the "evil eye"). "An anonymous poet stigmatizes Damagoras as outweighing plague in the balance (*ibid.*, 334); and Nicarchus compares another doctor, Zopyrus, to Hermes (Psychopompos), the guide to the infernal regions (*ibid.*, 124); but perhaps the wittiest epigram on the wholesale destruction of the sick is one which has been variously attributed to Lucian, Lucilius, and Agathias (*ibid.*, 401). A doctor sends his son to a tutor, but when the boy had learnt the first three lines of the 'Iliad' [which tell of the Trojan war sending many souls to Hades], his father said this lesson could be learnt at home, as he himself sent many souls to Hades, and for that had no need of a tutor."

Joseph Zabara, the Jewish author of the "Book of Delights" (finished about the year 1200), indulges in many gibes against the medical profession, though he himself was apparently a doctor. Thus, the following saying occurs in one edition: "A doctor and the Angel of Death both kill, but the former charges a fee." Another little story is typical of its kind: "A philosopher was sick unto death, and his doctor gave him up; yet the patient recovered. The convalescent was walking in the street, when the doctor met him. 'You come,' said he, 'from the other world.' 'Yes,' rejoined the patient, 'I come from there, and I saw there the awful retribution that falls on doctors; for they kill their patients. Yet, do not feel alarmed. You will not suffer. I told them on my oath that you are no doctor.'"[1]

To enumerate all the ancient and modern satirical sayings[2] of this

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[1] *See* Israel Abrahams, "The Book of Delights and Other Papers." The Jewish Publication Society of America, Philadelphia, 1912, p. 12.

[2] *See* especially the extensive collection entitled, "Le Mal qu'on a dit des Médecins," by Dr. G. J. Witkowski, of Paris; on the second series of this work is the appropriate device of a physician riding, with Death mounted on the same horse behind him. Several typical German epigrams of the kind are given by E. Holländer, "Die Karikatur und Satire in der Medizin," Stuttgart, 1905, pp. 175-177. A clever English one is that by "A. C." (*Spectator*, 1897), for which I am indebted to Sir William Osler:—

> "Wise Arruns, asked 'How long will Caius live?'
> Replied, 'Three days the fatal sisters give':
> And Arruns knew the prophet's art. But lo!
> Stronger than gods above or gods below,
> Euschemon comes: his healing art he tries,
> And in a single day poor Caius dies."

About the end of the eighteenth century in England a medical epigram could apparently hardly become popular unless it referred in one way or another to death. Witness the follow-kind and describe their artistic representatives, in the way of coloured prints, &c., would be too great a task. The satirical writings of Molière against the medical profession of the seventeenth century have their analogues in modern times in England as well as in other countries. Amongst the bitterest attacks in France may be mentioned Léon Daudet's "Les Morticoles," in which much of the medical teaching in Paris during the last decade of the nineteenth century is held up to ridicule and even to abhorrence.

To some extent, a doctor having the care of an acute and serious case may be likened to a whist-player, who, however well he plays, may yet have such bad cards that it is impossible for him to win the game. Yet in other cases his cards may be so good that mistakes in playing do not cause him to lose the game. In yet other cases, however, the playing of one wrong card will give the game into Death's hands. The design of a very striking modern German drawing is, I believe, Death playing a game of chess with a doctor for a human life (unless I am really thinking of Moritz Retzsch's drawing of 1831—the devil playing a game of chess with a young man for his soul, an angel looking on). A modern satirical cartoon by "Cynicus" (Martin Anderson) represents "Death and the Doctor" playing cards over a coffin. The rather corpulent doctor, seated in a comfortable armchair, plays deliberately without the least appearance of excitement, whilst Death seems eager to finish the game. On the coffin are bags of gold, suggesting the financial importance of the result to the doctor. (Cartoon No. 22 of

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ing very popular ones on the physicians of King George III, namely, William Heberden the younger, Matthew Baillie, and Francis Willis, men at the head of their profession in England, and on the Quaker physician and philanthropist, John Coakley Lettsom, the founder of the Medical Society of London:—

"The King receives three doctors daily—
Willis, Heberden, and Baillie:
Three distinguished clever men—
Baillie, Willis, Heberden;
Doubtful which more sure to kill is—
Baillie, Heberden, or Willis."

"When patients sick to me apply,
  I physics, bleeds, and sweats 'em;
Then—if they choose to die,
  What's that to me?—I lets 'em."

These humorous lines, with Lettsom's signature at the end, have been (doubtless incorrectly) attributed by some to the physician himself. Several slightly different versions exist.

The version which I have given above is the one authorized by J. C. Jeaffreson, in his very popular "Book about Doctors," but Mr. G. Bethell has kindly drawn my attention to three other versions quoted on equally good authority in *The Gentleman's Magazine* for August, "Cartoons, Social and Political," by Cynicus, published at 59, Drury Lane, London, 1893.)

There exist, of course, a very large number of satirical designs (sketches, engravings, coloured prints, &c.) in dispraise of physicians, surgeons, apothecaries, and naturally quacks and charlatans also. Several of those which are figured in Dr. Eugen Holländer's work, "Die Karikatur und Satire in der Medizin" (Stuttgart, 1905), suggest that the drugs and medical treatment, and not the diseases, kill the

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1904 (pp. 133, 134). In all of them the ending imitates Lettsom's signature to his prescriptions, namely, "I. Lettsom." The first is taken from "Old and New London," vi, p. 279—

"When any patients call in haste,
I physics, bleeds, and sweats 'em.
If after that they choose to die,
Why, what cares I?
I lets 'em."

The second claims to be the version told by Lettsom himself to the father of Mr. H. S. Cuming—

"If any folk applies to I,
I blisters, bleeds, and sweats 'em.
If after that they please to die,
Well, then I lets 'em."

The third version was obtained from Mr. Gorton, of the "Golden Sun"—

"I, John Lettsom,
Blisters, bleeds, and sweats 'em.
If after that they please to die,
I, John, lets 'em."

In *Notes and Queries* for March 10, 1906, p. 191, sent to me also by Mr. Bethell, an epigrammatic reply by a friend of Lettsom's is referred to—

"Such swarms of patients do to me apply,
Did I not practise, some would surely die.
'Tis true I purge some, bleed some, sweat some,
Admit I expedite a few, still many call.
I. Lettsom.

Mr. Bethell likewise refers me to *Notes and Queries* for March 17, 1906, p. 210, where a quotation is given from *The Wonderful Magazine and Marvellous Chronicle* for the year 1793, i, p. 346, ending as follows:—

"You say I'm dead, I say you lie,
I physicks, bleeds, and sweats 'em;
If after this my patients die,
Why, *verily*——
J. Lets—'em."

Of only one of these four physicians, namely, Francis Willis, does a portrait-medal exist. The medal in question, of which I had a good specimen in my collection, was struck on the recovery of King George III in 1789, and on the obverse bears a bust of Willis in low relief, with the medallist's signature, C. I. (and a little serpent) on the truncation (the medallist's name is, I believe, unknown). Good portraits exist, however, of the others. Of William Heberden the younger there is a painting by Richard Bothwell, and of Matthew Baillie there is one by John Hoppner, whilst Lettsom occupies a conspicuous place in Samuel Medley's picture of the early members of the Medical Society of London.

patients. There is, for instance, a sketch (Holländer, op. cit., p. 223) of the famous "Doctor Requiem, who cured all those that died"; there is the caricature of a charlatan (*ibid.*, p. 162), exhibiting triumphantly the hide of his "last radically cured patient"; there is Daumier's (modern) design of a doctor wondering why all his patients leave him, whilst "imagination" shows a queer procession of imps carrying coffins and the dead bodies of his patients, headed by Death (see *ibid.*, p. 173). Then there is W. Hogarth's "The Company of Undertakers" (1736), with the crowded caricature-portraits of doctors and quacks of the time, and, to complete the satire, the motto, "Et plurima mortis imago" (Virgil, "Aen.," lib. ii, 369), between two pairs of crossed bones (see *ibid.*, p. 179). An older print (*ibid.*, p. 178) shows a doctor inspecting the urine of a dead patient, illustrating the saying, "Après la mort, le médecin." A lithograph by Adolf von Menzel, of about 1832 (*ibid.*, p. 290)—"The Difference between Allopathy and Homœopathy"—shows the allopath and the homœopath both holding banners with the device of a skull and crossed bones; between them are Mephistopheles and Death, the latter grasping both the banners and saying, "Seid einig! einig!" Another caricature (*ibid.*, p. 337), by Th. Heine, shows two very modern looking ghosts floating over a cemetery. One of them apparently is saying, "That's all the difference: With homœopathy one dies of the disease, with allopathy one dies of the treatment."[1] A little German painting (in the Wellcome Historical Medical Museum, 1913) shows a doctor studying in a room overlooking a crowded graveyard. Death (a skeleton) is visiting the doctor as a friend and colleague, and (according to the paper which he holds) is saying, "Mein lieber Herr Collaborator, Sie sind gar zu fleissig" (referring doubtless to the overfull graveyard towards which his left hand is turned). By D. N. Chodowiecki (1726-1801), who likewise made a series of "Dance of Death" designs, there is a small engraving of Death appearing to a medical student, with the following inscription underneath:—

> "De grâce épargne moi, je me fais médecin,
> Tu recevras de moi la moitié des malades."

One of Thomas Rowlandson's "English Dance of Death" series (first volume, London, 1815) shows Death and the quack doctor

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[1] Compare the saying already quoted, "Young doctors kill their patients, and old doctors allow them to die."

"Nostrum," outside the shop of the undertaker, "Ned Screwtight"; and the letterpress (by W. Combe) describes how grieved the undertaker was when his friend Nostrum died so suddenly at his door. His wife explained that it was another job for him, and nothing to be sorry about, but—

"'You foolish woman,' he replied,
'Old Nostrum, there, stretched on the ground,
Was the best friend I ever found. . . .
How shall we undertakers thrive
With Doctors who keep folks alive? . . .
We've cause to grieve—say what you will;
For, when Quacks die, they cease to kill.'"

Similar allusions to the undertaker are of course very frequent. Thus, in "The Apothecary's Prayer," by G. M. Woodward (engraved by Thomas Rowlandson in 1801, and published by R. Ackermann, at 101, Strand, London), the Apothecary prays to Aesculapius that people may be ill and require medicines, and mentions that his neighbour, Crape, the undertaker, is suffering considerably by his (the Apothecary's) want of practice. I have seen two little English engravings, signed "W. E. G.," not dated, but apparently of the early part of the nineteenth century, which might be mentioned in this connexion. One of them depicts an apothecary on a horse which is running away and knocking people over. The inscription below is, "What could be expected of a horse with an apothecary on his back?" Below this are the words "Newcastle Apothecary." The other shows a huge widely open mouth, into which a funeral procession of medicine bottles is entering; at the rear of this procession come little figures of Death and the Doctor, apparently good friends, and chatting with each other. The title "A Medical Allegory," is inscribed below this print, on a mortar made out of a human skull with a long bone in it as pestle.

Amongst the caricatures of Medical Consultations (e.g., by L. Boilly, 1760) a remarkable one figured, after C. Motte, by Lucien Nass ("Curiosités Médico-Artistiques," Paris, first series, p. 6), represents four consultants seated in the patient's room. One of them, with much gesticulation, is explaining his views of the case in an excited manner; his discourse has had a soporific effect, not on his patient, but on his colleagues, and even Death (represented as a skeleton holding a scythe), comfortably seated on the ground behind the chair of one of the physicians, appears to have fallen into a doze.

An eighteenth century print of John Lightbody constituting the frontispiece to "A Physical Vade Mecum" (London, 1741), by

Theophilus Philanthropos (Robert Poole, 1708-52), illustrates the curious admixture of theology in some medical writings of the time. The physician (apparently a portrait of Dr. Robert Poole, the author) and patient are seated facing each other; the doctor feels the patient's pulse and prescribes for him. In the foreground are a skeleton and a coffin, the latter bearing the inscription: "As now I am, so must you be. Therefore prepare to follow me." On the right in the distance, Death (as a skeleton) threatens the patient with his dart, telling him: "Prepare to die, for behold Death, and Judgment is at hand." The various figures are connected by bands of inscriptions with a triangle (on which is the word ΘΕΟΣ) amidst clouds and cherub-heads in the sky. One of these bands explains what God is saying to Death: "Hold, stay thy hand, and give space of repentance." Below this whole complicated design are the verses—

"In the midst of Life Death doth us pursue,
Let us therefore with Speed for Mercy sue."

In further illustration of the stories current in dispraise of physicians, I will refer to certain little bronze coins struck in the island of Cos, bearing the portrait of Xenophon, a Coan physician, and a descendant of the family of the Asclepiadae, who practised at the Imperial Court of Rome in the time of the Emperor Claudius. Of three of these pieces in my father's collection the inscription accompanying the portrait on two (possibly of the second century A.D.) is ΞΕΝΟΦΩΝ; on the third (apparently of the first century A.D.) it is ΞЄΝΟΦΩΝ ΙЄΡЄΥϹ, showing that Xenophon was apparently a priest of Aesculapius, as well as a physician. This Xenophon, according to Tacitus ("Annal.," xii, 61), obtained certain privileges for his native island from his patron, the Emperor Claudius. According to Tacitus also ("Annal," xii, 67), he had the ingratitude to allow himself to be induced by the Empress Agrippina to help her to murder his patron (54 A.D.) by means of a poisoned feather which he was stated to have introduced into his mouth under the pretence of making him vomit. (For other references on the subject, see the notes in Orelli's second edition of the works of Tacitus, Zürich, 1859, vol. i, p. 388; also Pauly and Wissowa, "Real Encyclopädie der classischen Altertumswissenschaft," Stuttgart, 1899, vol. iii, column 2815.) The account of Tacitus runs as follows (Bohn's Oxford translation, London, 1854, i, p. 311): "In fact, all the particulars of this transaction were soon afterwards so thoroughly known, that the writers of those times are able to recount 'how the poison was poured into a dish of mushrooms, of which he was particularly fond; but whether it was that his senses were stupefied, or from the wine he had drunk, the effect of the poison was not immediately perceived'; at the same time, a relaxation of the bowels seemed to have been of service to him: Agrippina, therefore, became dismayed; but as her life was at stake, she thought little of the odium of her present proceedings, and called in the aid of Xenophon the physician, whom she had already implicated in her guilty purposes. It is believed that he, as if he purposed to assist Claudius in his efforts to vomit, put down his throat a feather besmeared with deadly poison; not unaware that in desperate villainies the attempt without the deed is perilous, while to ensure the reward they must be done effectually at once." From this account of Tacitus it is clear that Xenophon was called to his Imperial patient when the latter appeared to have eaten some poisonous food. He, as a physician, immediately did what would have been expected of him—namely, he endeavoured to induce vomiting (by tickling the patient's fauces with a feather). It is unlikely that any real evidence was forthcoming that he assisted the murder by introducing poison on the feather, or that he was in any way an accomplice in the crime.

Strictly speaking, under this paper's title, one might refer to various memorials and sepulchral monuments bearing inscriptions of medical interest. The famous epitaph on Dame Mary Page, in Bunhill Fields Burial Ground (London) records that she died in 1728, at the age of 55, and that she was tapped (*paracentesis abdominis*) sixty-six times in sixty-seven months, and "had taken away 240 gallons of water, without ever repining at her case, or ever fearing the operation." A similar epitaph on Mrs. Susanna Wood, in the graveyard of Bermondsey parish church, records that that lady died in 1810, aged 58, after a long illness, which she bore with the greatest fortitude: "she was tapped ninety-seven times, and had 461 gallons of water taken from her, without ever lamenting her case or fearing the operation." There is a sepulchral marble at Senlis, commemorating the death, in 1673, after the Cæsarean operation, of a woman who saved the life of her unborn child by voluntarily undergoing that operation; she herself died as the result, and thus by her death for the sake of her child, as the inscription states, "she succeeded in uniting Love and Death." Much grim humour of a homely sort has been displayed in epitaphs relating to the causes of death, but the genuineness of many of them may be doubted. There is, for instance, that on the poor old body, who "had two sore legs and a baddish cough, But her legs it was that carried her off." Then there is one on the old woman who appeared "so cunning, While one leg kept still, the other kept running." The following are "chestnut" examples:—

> "This little hero lying here
> Was conquered by the diarrhœa."
>
> "Here lie I and my four daughters,
> Killed by drinking Cheltenham waters.
> Had we but stuck to Epsom salts,
> We wouldn't have been in these here vaults."

The next epitaph (on a baby) might well be applied to examples of excessive infantile mortality, of specific origin:—

> "Since I am so quickly done for,
> I wonder what I was begun for."

Death from gangrene of the foot commencing after the careless cutting of corns (which has not rarely occurred in senile diabetics and arteriosclerotics) is commemorated by a fanciful epitaph, beginning:—

> "Here lie the bones of Richard Lawton,
> Whose death was strangely brought on,
> Trying one day his corns to mow off,
> The razor slipped . . ."

J. D. Rolleston[1] refers to several strange causes of death mentioned in epigrams from the "Greek Anthology." A grimly humorous example of such epigrams is the following ("Anthol. Graec.," Tauchnitz edition, 1829, ix, No. 67): "A young man hung a garland on the column of his stepmother's tomb, thinking that in death her character had changed. But the column fell on the tomb and killed the young man. Children of a former marriage, beware your stepmother's grave!" The epigram by Diogenes Laertius (*ibid.*, vii, No. 112) on the peripatetic philosopher Lycon (third century B.C) is thus given by Rolleston: "No, by Zeus, we will not forget Lycon, whom gout killed; but what I marvel at most is that he who could only walk with the feet of others, traversed in a single night the long road to Hades."

One or two epitaphs refer to the "resurrectionist" period in the history of medical and surgical anatomy[2]:—

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[1] *Proc. Roy. Soc. Med.*, 1914, vii (Section of the History of Medicine pp. 34 *et seq.*

[2] See *Brit. Med. Journ.*, 1908, i, p. 1340, and *Lancet*, 1903, i, p. 899.

"Though once beneath the ground this corse was laid,
For use of surgeons it was thence conveyed.
Vain was the scheme to hide the impious theft—
The body taken, shroud and coffin left.
Ye wretches, who pursue this barbarous trade,
Your carcases in turn may be conveyed
Like this to some unfeeling surgeon's room;
Nor can they justly meet a better doom."

"Her body dissected by fiendish men,
Her bones anatomized,
Her soul we trust has risen to God,
A place where few physicians rise."

With these epitaphs referring to the old "body-snatching" days of the "resurrectionists" Hogarth's "Reward of Cruelty" (1751) may be compared, as it well illustrates the popular horror of the idea of post-mortem examinations in England during the eighteenth century. It is the caricature of the dissection of a criminal's body at Surgeons Hall in Old Bailey, London. The rope by which the murderer ("Tom Nero") was hung at Tyburn is still around his neck, his intestines are being placed in a pail below the dissecting table, and a dog has taken possession of his heart. The skeletons of two recently executed criminals, labelled respectively "Macleane" (James Maclaine or Maclean, a noted "gentleman highwayman," hung at Tyburn in 1750), and "James Field" (executed for highway robbery early in 1751) adorn niches in the walls. Clearly, in this caricature the anatomists and surgeons who dissect the criminal's body were held out to youthful hooligans as bogies to children—namely, as additional instruments of (post-mortem!) punishment for the crimes committed by murderers, highwaymen, &c. This popular dread of being subjected to dissection after death recalls the mediæval horror of the body being "tortured" after death by being "eaten by worms"—a subject frequently referred to in mediæval and later poetry and art. An engraving of about 1480 by the "Meister I. A. M. von Zwolle" (the "Meister mit der Weberschütze") pictures Moses with the tables of the Ten Commandments in an upper compartment, and a skeleton-like corpse being "eaten by worms" in a lower compartment. The design was evidently intended to illustrate certain passages in "Ecclesiasticus" (x, 11, and xxviii, 6): "For when a man is dead, he shall inherit creeping things, beasts, and worms"; "Remember corruption and death, and abide in the commandments." To increase the horror of the subject mediæval and later art often magnified the worms into serpents. In a short Latin poem by Anselm, Archbishop of Canterbury (died 1109), included in Migne's "Patrologiæ Cursus Completus," the poet speaks of a man dying "a second death" when his body is thus tortured ("cruciatur") after his "death proper":—

> "Nam caro mortalis, et quisquis ei famulatur
> Morte perit duplici, quia post obitum cruciatur."

After all, this idea of a "double death" is scarcely more far-fetched than Petrarch's poetical idea of a great man's "second death"—that is, when his tomb and monument decay and fall to pieces—and his "third death"—that is, when his writings are destroyed or forgotten. In his third dialogue "De Contemptu Mundi," Petrarch makes Saint Augustine quote the passages in question from his own (Petrarch's) Latin epic poem, "Africa":—

> "Mox ruet et bustum, titulusque in marmore sectus
> Occidet, hinc mortem patieris, nate, secundam.
> . . . . libris autem morientibus, ipse
> Occumbes etiam: sic mors tibi tertia restat."

In works of art representing death-bed scenes the medical attendants have frequently been represented, and by caricaturists (Hogarth, &c.) not always in a light very creditable to the profession. But in one of the illustrations to the mediæval religious "text-book," entitled the "Ars Moriendi," or "Speculum Artis bene Moriendi," the doctor is depicted under very peculiar circumstances. The patient on his death-bed is being tempted by impatience, which for a time he cannot resist. In the British Museum block-book (printed in the Netherlands about 1460) he is shown as having already upset the table with the food and medicine on it, and is unceremoniously pushing the doctor away with his foot, whilst a lady (his wife?) appears (according to the words on the label) to be excusing him on account of his suffering. A demon with bat's wings, by the bed, rejoices at having been successful.[1]

A curious connexion between medicine and death is that illustrations of skeletons in medical anatomical works have sometimes been utilized by artists in designing figures of Death for medals and other works of art. Particularly employed in that way was a certain woodcut in Vesalius's famous anatomical work, "De Humani Corporis Fabrica," printed by J. Oporinus, at Basel, 1543 (p. 164). It represents a skeleton meditating over a skull and leaning on an altar, inscribed: "Vivitur ingenio, caetera mortis erunt" (*see* figure). This design is by Jan von Calcar, a pupil of Titian, whose paintings were said to be almost indistinguishable from those of Titian himself. Jan von Calcar's design

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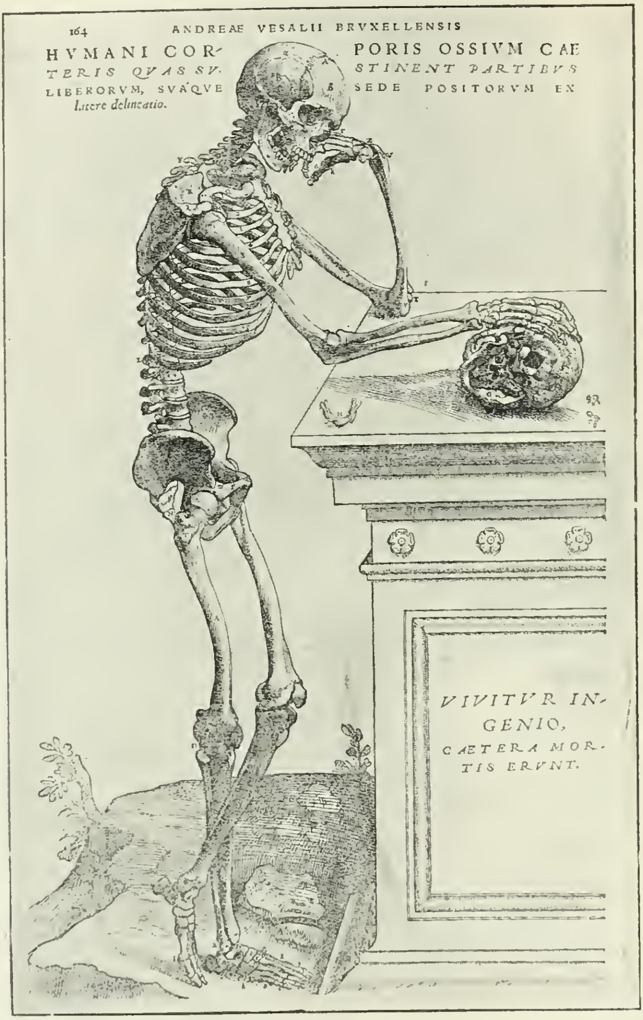
[1] Cf. F. P. Weber, loc. cit., pp. 48-55, also fig. 13 (after Lionel Cust), showing the "temptation by impatience," by the Master E. S.; the design is quite similar to the corresponding illustration in the British Museum block-book version of the "Ars Noriendi."



Anatomical woodcut by Jan von Calcar, on p. 164 of the "Anatomy" of Vesalius, 1543.

evidently suggested the figure of Death (meditating over the apple of the garden of Paradise) in a stone relief of the Renaissance period, figured by J. von Schlosser ("Werke der Kleinplastik," Vienna, 1910, i, plate 2). It likewise suggested the skeleton leaning on an altar on the reverse of certain medals of the Adolph Occos, especially the third physician of that name at Augsburg (died 1606)[1]; also the skeleton on the reverse of a Danish *memento mori* medal, dated 1634, supposed to commemorate the tragic death of Anna Cathrina, a daughter of King Christian IV of Denmark by his morganatic wife, Christina Munk; and indirectly, also, the reverse of a medal by Christian Maler, which was copied from the preceding medal.[2]

The woodcut by Calcar just referred to, with its philosophical inscription, reminds one that formerly philosophical considerations on life and death were sometimes introduced into anatomical lectures and demonstrations. An engraving by Andreas Stock after a painting by J. de Gheyn, shows Pieter Paaw or Pauw (Pavius), demonstrating in the Leiden anatomical theatre; a skeleton is mounted upright in a conspicuous part of the room, holding a banner with the inscription, "Mors ultima linea rerum" (Horace). In another engraving of the theatre, by W. Swanenburg after J. C. Woudanus, in 1610, skeletons are represented holding up *memento mori* and kindred quotations such as the aforesaid "Mors ultima linea rerum"; "Nascentes morimur" (Manilius); "Principium moriendi natale est"; "Mors sceptra ligonibus aequat"; "Nosce te ipsum"; "Pulvis et umbra sumus" (Horace). These sayings were introduced less probably for the benefit and instruction of the medical students than for the edification of the learned men, lawyers, travelling noblemen, fashionable ladies and sightseers, who in former times used to visit the anatomical theatres out of curiosity or in search of emotional distractions. Note the miscellaneous crowd watching Vesalius dissecting, on the engraved title-page (designed by Jan von Calcar) of his great anatomical work, just referred to, "De Humani Corporis Fabrica" (Basel, 1543).

I might finally allude to the consolation for the idea of death said to be afforded by the evils of old age and disease. Gout is mentioned in this way in some verses addressed to Death in the "Greek Anthology" ("Anthol. Graec., Appendix," Tauchnitz edition, Leipzig, 1829, No. 196):—

Ἦλθες ἐμῆς ζωῆς γλυκερώτερος ὅς μ' ἀπέλυσας
Νούσων, καὶ καμάτων, καὶ μογερὰς ποδάγρας.

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[1] *See* F. P. Weber, loc. cit., pp. 267, 268, and fig. 122 on p. 443. Adolph Occo III (1524-1606) was a numismatist as well as a physician, and was doubtless a friend of the princely and art-loving Fuggers, of Augsburg, of his time.

[2] Cf. F. P. Weber, loc. cit., pp. 273-276; also figs. 56 and 57.

Compare the lines by Agathios ("Anthol. Graec. Palat.," x, 69) and the following Latin epitaph inscriptions:—

> "Quod superest homini, requiescunt dulciter ossa,
> Nec sum sollicitus ne subito escuriam,
> Et podagram (*sic*) careo, nec sum pensionibus arra,
> Et gravis aeterno perfruor hospitio."
> ("Corp. Inscr. Lat.," vi, No. 7193*a*.)

> "Morborum vitia et vitae mala maxima fugi.
> Nunc careo poenis; pace fruor placidâ."
> ("Corp. Inscr. Lat.," v, No. 5278.)

If we pass on to Christian writings we find that Anselm, Archbishop of Canterbury (died 1109), in the longer poem, "De Contemptu Mundi," printed in Migne's "Pathologiae Cursus Completus," almost overdraws the ills that human flesh is heir to. But we must remember that very much less was known in Anselm's days than now in regard to the medical and surgical relief of aches and pains of all kinds. Nowadays pain can frequently be removed by ordinary rational methods which formerly lasted very long, or was only escaped from by death. Surgical anæsthesia—the "death of pain"—together with surgical asepsis and antisepsis—the "death of microbes"—often enables modern healing art to ward off death and "kill" the cause of pain. Following is the portion of Anselm's poem to which I wish to draw attention:—

> "Si nunc aspicias animalia caetera quaeque;
> Invenies tantis subdita nulla malis.
> Nos capitis laterumque dolor, febrisque fatigat:
> Totum hominem tollit lepra, chiragra manus,
> Dira podagra pedes; oculos ophthalmia caecat:
> Obsidet arctati pectoris asthma vias.
> Laesa suos claudit lithiâ vesica meatus:
> Viscera torquentur, parsque pudenda, colon.
> Dens dolet, aut cervix; os torpet; lingua ligatur.
> Splen tumet; aegrotat pulmo, laborat hepar.
> Cor marcet; renes patiuntur; solvitur alvus;
> Brachia nil possunt; languida crura jacent."

In like manner, Pope Innocent III (died 1216), in his prose writing, "De Contemptu Mundi" (Migne's edition), pictures (with some humour) the supposed evils of old age. In fact, he gives us a kind of caricature of its infirmities: "Si quis autem ad senectutem processerit, statim cor ejus affligitur, et caput concutitur, languet spiritus et fetet anhelitus, facies rugatur, et statura curvatur, caligant oculi, et vacillant articuli, nares effluent, et crines defluunt, tremit tactus, et deperit actus, dentes putrescunt, et aures surdescunt. Senex facile provocatur, difficile revocatur; cito credit, et tarde discredit, tenax et cupidus, tristis et querulus, velox ad loquendum, tardus ad audiendum, sed non tardus ad iram: laudat antiquos, spernit modernos: vituperat praesens, commendat praeteritum, suspirat et anxiatur, torpet et infirmatur. Audi Horatium poetam: 'Multa senem circumveniunt incommoda.' Porro nec senes contra juvenem glorientur, nec insolescant juvenes contra senem, quia quod sumus iste fuit, erimus quandoque quod hic est."

Some Physiological Phantasies of Third Century Repute.

By B. GLANVILL CORNEY, I.S.O.

THE impressions of which I purpose giving an outline in this paper seem to have held a place in the popular mind in Southern Europe for quite a considerable period—one that could be measured, at any rate, by centuries. The mysterious circumstances attending gestation, birth, and development have always appealed to biologists as an attractive field for speculative thought; but in the remote past, before anatomy had attained the rank of a scientific study, and while experimental methods of research had yet to be devised, even great minds were prone to believe in the supernatural and imagine the marvellous, rather than apply themselves to the sober examination of facts and circumstances, for the elucidation of truth mere and unadorned.

Professor Elliot Smith has told us that the study of human anatomy as an aid to the healing art was evolved among the Greeks of Alexandria from practices, or processes, long in vogue among the more ancient Egyptians for quite another object—the embalming of their dead. We know how slowly that study progressed, and how crude anatomical knowledge still was, even many centuries after the beginning of the Christian era. Without exact anatomical knowledge the study of physiological processes can scarcely have consisted in more than conjecture; sometimes based on intelligent observation, it may be, but mostly the guesswork of simple empirical lore—the wisdom of the witch, the sorcerer, and the sacerdotal magician. Empirical knowledge is, after all, but the outcome of haphazard observation, either on the part of its possessor or of some other person or persons before his time. Otherwise stated, it may be said to embody the teachings of experience; but of casual experience, not experience gained through research.

Such knowledge comes slowly, and some centuries may well have elapsed after anatomy began to be practised at Alexandria as a succedanæum to the acquirement of surgical and medical skill, before physiology joined hands with it. If this was so, I may claim justification for describing as phantasies some notions about physiological phenomena enumerated by Pliny and Solinus; and I will presently invite you to hear them related in the words of the latter author, faithfully translated into Elizabethan English by one Arthur Goldinge. But first let me ask you to bear with a few introductory words about the author and the translator, and their works.

Arthur Goldinge never graduated in Arts; nor is it by any means certain that he studied at a University at all, though some do aver that he kept a term or so at Cambridge. But on his title-pages he subscribed himself a "gentleman," and in his texts he proved himself a scholar, in spite of never having worn a hood. This Goldinge flourished in the time of the Reformation in England, and did a good deal of translation from Latin authors. Moreover, he generally did it well, though he was not a writer of much originality himself, becoming chiefly renowned for his admirable versions of Ovid's "Metamorphoses" and the "Commentaries" of Julius Cæsar. And, which is much to the point, his merit was ungrudgingly acknowledged by his contemporaries. But, if his verse was skilful, it must be owned that his spelling was slipshod—assuming, of course, that it was his custom to revise his proofs. It was not even uniform—a common enough defect in the times in which he lived and learnt it. Goldinge had already acquired literary repute when Queen Elizabeth began to reign, though it was not until 1587 that he published his English rendering, prepared some few years before that, of the "Polyhistor of Julius Solinus," which was the first translation from that author's text into any modern language.[1] To this Goldinge added, a little later, "The Rare and Singular Worke of Pomponius Mela, that excellent and worthy Cosmographer"; and the two books were then issued together in one volume "at London, printed for Thomas Hacket, to be solde at his shoppe in Lumbertstreete, under the signe of the Pope's head. *Anno* 1590," being dedicated to Lord Burghley, who was to some extent Arthur Goldinge's patron.

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[1] "The excellent and pleasant worke of Julius Solinus, '*Polyhistor*.' Contayning the noble actions of humaine creatures, the secretes and providence of nature, the description of Countries, &c. Translated out of Latine into Englishe by Arthur Goldinge, Gent.—*London*, 1587."

Now, it is abundantly obvious, even to a casual critic, that this same Solinus was an imitator of Pliny, who died a century or so before him. The "Polyhistor" is a geographical sketch, containing, besides descriptions of lands and seas, a brief historical outline of the city of Rome, and notices of various peoples, their cults, rites and customs, together with distinctly marvellous accounts of animals, plants and minerals. Sentences are copied wholesale from Pliny's "Natural History," some also from Pomponius Mela, of whose "De Situ Orbis" Pliny himself made considerable use. While Solinus names nearly a hundred authorities, he never so much as once mentions Pliny; hence he has by some been condemned as a plagiarist, and even stigmatized as "Pliny's ape"—"in lyke manner," says Goldinge,[1] "as Julius Capitolinus, Plinius Caecilius and Sidonius Apollinaris reporte that Titian was called the 'Ape of the Orators' and Arulen the 'Ape of the Stoiks.'" Moreover, Pliny, too, was not ashamed to draw at times on Aristotle, nor (if we may believe Nicolaus of Lonigo)[2] on Dioscorides the Freckled, and others.

Some of Solinus's observations—"*Collectanea rerum memorabilium*" as they were at one time styled—bear so closely upon the history of medical science, and have been so quaintly Englished by our friend "Goldinge, Gent.," that it is considered they may prove of interest, nay perhaps diverting, to members of the Section, most of whom are, doubtless, already familiar with Pliny's writings. And the fact that so many of the *items* are borrowed from accredited earlier writers need not lessen, but should rather mark, their point.

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[1] After Giovanni Camers, whom he calls John Camertes.

[2] Nicolaus of Lonigo, hence called Leonicenus, flourished at Ferrara towards the end of the fifteenth century and early in the sixteenth. He died in 1524, at the age, it is said, of 100, being eulogized by his publisher as *vir doctissimus*, and by many of his disciples in similar terms. He was, in fact, a man learned in the literature of Physic and in the mysteries of mediæval healing art. He seems to have had a mind disposed to observation, and likewise, therefore, to criticism; for he wrote a series of essays on the action of Galenicals and the value of serpents, vipers, and other ὕλαι ἰατρικάι of the period as aids to treatment. In them Nicolaus avers that Pliny did not know enough Greek, and that consequently, when copying largely from Dioscorides, of Alexandria, he often made mistakes in his "cribs." In this, Nicolaus is supported by Hermolaus Barbaro (Patriarch of Aquileia), who pointed out nearly 5,000 errors in Pliny's work (says Louis Moreri), and 300 in Pomponius Mela's. Serapion, of Alexandria, and even Avicenna, amongst other *hakim*, come in for a share of his animadversion; while he pins his faith rather on Dioscorides, among the ancients, and sides with Barbaro and Georgius Merula—his own contemporaries—who were critics and commentators like himself. His essays were first printed at Ferrara, in 1492, not without provoking a retort from Pandolfo Collenuccio, the historian of Naples, in Pliny's defence. They were reprinted at Basel in 1529, a few years after his death, and form a tidy little quarto volume. Nicolaus also wrote commentaries on the works of Hippocrates and of Galen; and a treatise "*de Epidemia quam vulgo Morbum Gallicum vocant*," which last was published at the Aldine Press in 1497, and constitutes one of the earliest studies extant on syphilis. In the Ferrara edition of 1492, the criticisms on Pliny begin "*Nicolai leoniceni de Plinij et pluriu aliorũ medicina erroribus liber.*" There were no title-pages in those days.

Though best known to posterity as a literary hack, Solinus was himself, it would appear, a man of receptive mind, a dabbler in the moral and physical sciences; and furthermore, as some describe him, a grammarian. Which, indeed, he may well have been, for there is evidence in his writings that he had studied Varro; although classical critics allege that his Latin is rough-cast or debased. He seems to have lived in the first and second quarters of the third century of our era, and to have been a Roman; but the place of his birth is not definitely known, nor is there anything on record about his parentage or his career. His biographer was Giovanni Camers. Only the "Polyhistor" has come down to us from Solinus's pen,[1] unless it be a few stanzas of a poem attributed to him by his principal commentator prior to Mommsen—the erudite Claude de Saumaise, whose monumental "Exercitationes" were first published at Paris in 1629 and are brimful of interest and learning for those who have time and inclination to explore them. But they fill a folio volume (in mediæval Latin) of some 1,200 pages: which is vastly more than the subject merits for its own sake.

The "Polyhistor" of Solinus was one of the earliest printed books. An edition beginning "*De Situ et Mirabilibus Orbis capitula*" appeared from the Jensen press at Venice in 1473; and two others in quick succession (undated) at Rome and Milan. Many more have been published since then, of which Mommsen's text is the most recent (1864) and appears the most reliable. After Goldinge's translation, which, as has been stated above, was the first to be made, others were issued in Italian, in German, and in French. The French one is the latest production (1847), and the least accurate. The extract which here follows is from Goldinge's version: it has been collated with the original Latin text of Solinus as reprinted by Mommsen, and found to agree with it so closely and excellently that the labour of reading them together became a delight.

"**For** inasmuch as wee are minded to make a note of thinges worthy to be touched, concerning lyuing creatures, as y^e Countries of eche of them seuerally shal put us in remembraunce, Reason would we should begin chiefly at that creature which nature hath preferred before al others in iudgement of undertaking, and capacitie of wisedom.[1] . . . Of women some be barren for ever: othersome by change of Husbandes become fruitfull. Many beare but one Childe: and diuers bring foorth eyther onely Males, or onely Females. After fiftie yéeres the fruitfulnesse of them all is at a point; but Men begette children untill they be fourescore, like as King Masinissa[2] begat his Sonne Metymathnus, when he was at the age of fourescore and five yéeres. Cato,[3] when he was ful fourescore yéere old and upward, begat the grandfather of Cato[4] that killed himselfe at Utica, upon the daughter of his client Salonius.[5]

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[1] "Some hold opinion that he left other monumēts of hys wyt, which eyther by force of time are perished, or els perchaunce lie hyd in some blinde corner among mothes."—A. G.

"Thys is also found to be of a trueth, that when two are conceived one somewhat after another, the woman goeth out her full time of them both, like as hath been séene in Hercules and his brother Iphiclus, who béeing carryed both in one burthen, had notwithstanding lyke distaunce of time betwéene their birthes, as there was distaunce betwéene their begetting.[6] And likewise in a wench called Proconesia, who committing aduoutry with two sundry men, was delivered of a payre of Twinnes eche of them resembling his Father.[7] This Iphiclus begat Iolaus, who, entering the Iland Sardinia and there alluring unto concord the wauering minds of the inhabitants, builded Olbia and other Greeke Towns.[8] They which after his name were called Iolenses, reared a Temple over his Tombe, because he, following the vertues of his uncle, hadde deliuered Sardinia from many euilles.[9]

[1] Meaning woman.

[2] Masinissa was a famous Numidian chief or *emir*, who figured successively on the side of the Carthaginians and that of the Romans, in the Punic and other wars. He is credited with having left fifty-four surviving sons, of whom three were legitimate. He died in the year 149 B.C., at the age of 90, having taken the field so lately as two years before that against the Carthaginians. His own country corresponded to the modern province of Constantine in Algeria, and he was probably of the race of Kabyles or Berbers.

[3] That is, Marcus Cato the Censor.

[4] This was M. Caius Cato, called the Younger or Utensis.

[5] Salonia was Cato's second wife, quite a young woman, daughter of his secretary or steward. Plutarch relates the story in his Life of Cato the Censor.

[6] Accounts of Alcmena's delivery are not in general agreement.

[7] Solinus reads "Et de Proconnēsi ancilla, quæ e duplici adulterio geminos edidit," &c. Pliny has it, "Item in Proconnesia ancilla quæ eiusdem diei coitu," &c. Proconnesus was the island now known as Marmara, from which the whole Propontis Sea takes its modern name, in reference to the marble quarries on its shores. No doubt the "wench" in question was a domestic or slave-girl, native of, or serving in, the island. But Goldinge is wrong for once in quoting her as *called* Proconesia, if he means that as her name.

[8] Traces of Olbia still exist near the present town of Terranova, in the very beautiful bay of that name on the north-eastern coast of Sardinia.

[9] This sentence and the last preceding one are somewhat beside the point; they may have got misplaced, or perhaps intercalated in some transcript, and subsequently copied as part of the original text. The sentence which follows them in Solinus's text is omitted altogether by Goldinge in his translation—perhaps because of its inherently indelicate trend.

"The tenth day after cõception will by some paine put the Mothers in remẽbraunce that they be with Child. For from that time forward, their heads shall begin to bee disquieted and their sight shal ware dimme. Also the appetite of their stomack shall abate, and they shall beginne to loathe meate.[1] It is agreed upon among all Men, that of the whole Flesh, the first part that is formed is the harte, and that it increaseth unto the thréescore and first day, and afterwarde diminisheth againe: and that of gristles are made the backbones: and therefore it putteth them in daunger of death if eyther of both of those partes be hurt. Doubtlesse if it be a Male child that is fashioning the women that beare them are better coloured, and their deliueraunce is more speedy, and finally it beginneth to stirre at the fortie day. The Female stirreth not before the fourescore and tenth daie, and the cõception thereof dyeth y^{e} countenaunce of the Mother with a pale colour, and also hindereth the legges with a faint slownesse in going. In bothe kindes, when the heare beginneth to growe, then is the greater disease,[2] and the paine is more bréeme[3] in the full of the Moone, w^{c} time is alwaies noisome to thẽ when they are borne. When a Woman wyth Child eateth meates that are ouersalt, the Child shal be borne without Nayles.[4] At such time as the byrth béeing fully rype approcheth to the instant of deliueraunce, it greatlie auaileth the Woman that laboureth to holde her breath, for asmuch as yawning dooth wyth deadlie delay prolong the deliuery.[5] It is againste nature for the byrthe to come foorth with his féete forward, and therefore as Children hardly borne, they are called in Latine *Agrippa*.[6] Such as are so borne are for the moste parte unfortunate and short liued. Onely in one Man, namely Marcus Agrippa, it was a token of good lucke: howbeit not altogether so misfortunelesse but that hee suffered more aduersitie then prosperitie. For with miserable paine of his Feete, and the aduoutry of his wife, and certaine other marks of ill luck, hee did abye ye foretoken of his awke byrth.[1]

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[1] Here Pliny writes, "fastidium in cibis, redundatio stomachi indices sunt hominis inchoati." Solinus gives it "ciborum quoque fastidiis stomachi claudetur cupido." Both seem to rather understate the physiological fact as we are accustomed to meet with it nowadays in our professional life.

[2] "Disease" is here used in the sense of discomfort, or distress.

[3] "Bréeme," or breme, is an archaism for "sharp" or "intense." It is a word of Anglo-Saxon origin, and is said to be still in use in some country districts in reference to a sow *maris appetens.*

[4] Or, as we might say now, indulgence in highly seasoned dishes ("salsioribus cibis") should be avoided during pregnancy, as tending to promote premature expulsion of the ovum —*i.e.*, before the seventh month, when the nails form.

[5] On this point, with which we are all so familiar, Solinus takes his cue rather from Aristotle than from Pliny, whose statement he has somewhat perverted; but Goldinge is true to his text.

[6] "In pedes procidere nascentem contra naturam est" (Pliny) no doubt includes breech presentations, or even points chiefly to them. The name "Agrippa" is ascribed thus: "quo argumento eos appellavere Agrippas ut *aegre partos*"; but this derivation is not generally accepted by modern scholars. Claude de Saumaise says that in Rome "Agrippa" was at first a prænomen, and became only later a cognomen; but that it was originally a Greek name derived from ἀγρέω or ἀγρεύω (root word ἄγρα, the chase) and ἵππος, and had therefore reference to hunting—which seems more likely to be truth.

"There is also an unfortunate manner of byrth in the Female kinde, like as was séene by Cornelia the Mother of the Gracchuses, who made satisfaction for her monstrous byrth, wyth the unluckye ende of her children.[2] Againe the byrthe is the more luckie where the Mother dyes of it; as was séene by the first Scipio Africanus, who after y^e death of his Mother, because he was ript out of her wombe, was the firste of the Romaines that was called CAESAR.[3]

"Of Twynnes, if the one remaine still and y^e other perish by beeing borne before his time, hee that is borne at his full time is called *Vopiscus*.[4]

"Some are borne wyth teeth, as Cnaeus Papirius, Carbo, and Marcus Curius, who for the same cause was surnamed 'the toothed.'[5] Some instéede of téeth have the roome supplied with one whole bone. After which manner

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[1] Pliny quotes several further examples of ill-luck following this complication. Abye or "abie," was old English from the Gothic and Old Norse. It meant to suffer, or do penance for, to bow or submit to, and so, in this instance, "to expiate." Awke, oftener "auke," is also from the Old Norse, and meant reversed or inverted—wrong end foremost; but sometimes it was used in the sense of "sinister," or "ill-omened."

[2] It would appear that the mother of the Gracchi had the misfortune to be born with an imperforate hymen—"Feminis perinde est infausta nativitas, si concretum virginal fuerit, quo pacto genitalia fuere Corneliae, quæ editis Gracchis ostentum hoc piavit sinistro exitu liberorum." Goldinge's mediæval use of the word "monstrous" here, for *ostentum*, is in the sense of portentous or ominous, rather than of abnormal merely.

[3] This is an accurate translation from Solinus's text. Pliny writes "Auspicacius enecta parente gignuntur sic Scipio Africanus prior natus primusque Caesarum a caeso matris utero dictus, qua de causa et Caesones appellati"; and adds the case of Manilius, who entered Carthage with an army. De Saumaise vehemently denies the truth of Pliny's assertion, and points out that not only was Claudius extracted by suprapubic hysterotomy at a date earlier than the Samnite war—in which he took part in B.C. 296-98 (Scipio Africanus being born in 234)—but that the name "Caesar" is old Latin, and signifies *κηρίωντα*, whence Caesaries or Caesaria: *ἡ κόμη κηρίωσα*. The connection seems obscure, however. De Vit, in his supplement of proper names to Forcellini's "Totius Latinitatis Lexikon," quotes Spartian for an alternative derivation from a Phœnician or Berber word spoken of some hero who slew or knocked down an elephant with his own hand—or perhaps merely carried a shield made of elephant's hide. Another and better suggestion, by Festus, is *Caesaries*, hairy, in reference to a child born with more hair than usual; and the origin of this word is traceable to the Sanskrit root meaning hair. There is also the Arabic and Persian *kasr*, a fortress or principal chief's place of residence, whence *castra*. For a lengthy disquisition on the derivation of "Caesar" as the family name of the *gens* Julia, the reader may consult Dr. Vincent De Vit's "Onomasticon," or Robert Estienne's "Thesaurus," but he must not feel disappointed if he fails to reach finality from either or both of them on this question.

[4] This name is understood to be derived from *ὀπίσθε*, *ὀπίσθεν*, meaning hinder, hindmost, following after. "*Vopiscos* appellabant e geminis qui retenti utero nascerentur altero interempto abortu," says Pliny.

[5] "Dentatus." Some readings give Maximus for Marcus. Mommsen's text has M'; de Saumaise's M. The comma after Papirius is redundant, he being Carbo.

Prusias, King of Bythinia, had a Sonne.[1] The téeth differ in number according to the difference of the kind. For in men are moe, and in women are fewer of those téeth which are called Dog-teeth.[2] Unto such as have two double téeth growing up uppon the right side of theyr mouth, it behighteth the fauour of Fortune. And unto such as have them on the left side, it betokeneth the contrary.[3]

"The first voyce of Children after they bee borne is wayling. For the declaration of myrth is delayed to the forteth daie. We knowe of none that laughed the same howre he was borne, but onely one; that is to wéete Zoroastres, who became moste skilfull and cunning in all good artes. But Crassus, the Grandfather of him that was slayne in the battell againste the Parthians,[4] because he never laughed was surnamed Agelastos.[5] Among other great thinges y^e were in Socrates, this is worthy to bee noted, that hee continued always in one manner of countenance, even when hee was troubled with aduersitie. Heraclitus, and doggish Diogenes[6] did never abate one whittle of theyr stiffe stomackes, but treading under foote the fformes of all casualties, continued unchangable in one purpose, againste all gréefes and miseries. It is Registered among other examples, that Pomponius the Poet, such a one as hadde béene Consull, did never rasp.[7] It is verye well knowne, that Antonia the Wyfe of Drusis, didde never spette.[8] Wée have heard of dyuers that have been borne wyth whole boanes not hollow wythin, and that such are wont neither to sweat nor to be a thirst: of the which sort Lygdanus of Syracuse is reported to be one: who in the thyrtie and thrée Olimpiad caried away the firste Garlond of victory in the exercises of actiuitie, from y^e gaming of Olympus, and his bones were found to have no maroe in them. It is most certaine that the greatest substance of strength commeth of the sinewes; and that the thicker they bee, so much the more dooth the strength increase. Varro in his Register of monstrous strength, noted that there was one Tritanus a Sword-player, a Samnite borne,[1] that had sinewes both right out, and crosse ouerthwart, and that not only the bulke of his breast, but also his handes and his armes, were as it were lattised with sinewes;[2] who foyled all his aduersaries with a filippe, and almost with carelesse encounters. And that the Son of the same Man, a Souldiour of Cneus Pompeussis, beeing borne in the same sort, did set so light by an enemie that did challenge him, that beeing himself unarmed, he ouercame him, and taking him prisoner, carried him with one of his fingers into his Captaines Pauilion.

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[1] Prusias II was called deformed—"*τήν τε ὔψιν ὢν εἰδεχθὴς, καὶ τὸ σῶμα δία τὴν τροφὴν ἔχων γυναικεῖον*" ["Diod. Sic." xxxii, 19]. It appears from Pliny that the peculiarity here mentioned was only ascribed to the upper maxilla—"superna parte oris"—but even so it seems difficult of comprehension. *Cf.*, Suidas, II, 499; Polybius, xxxvi, 15 (37, 2).

[2] It is a general belief among the natives of the Fiji Islands that the order of eruption of the incisors depends on sex, but they are by no means agreed among themselves as to which has priority. Anatomists and dentists agree generally that the third molars are more often wanting in the female than in the male adult.

[3] Then the ordinary mortal's chances in life must be fairly even! Behighteth = bodeth.

[4] The battle of Charae, where Surena overcame Crassus in B.C. 53. The place is about a hundred miles to the north-eastward of Aleppo, being the Haran of Scripture, by which name it is still called. It was, next to Ur, perhaps the chief centre of worship of the Babylonian moon-god Ṣin, to whom a temple was dedicated there.

[5] Meaning mirthless, or grave. Cicero tells us, however, on the authority of Lucilius, that Crassus did laugh—once. That was on seeing an ass eat thistles, a folly which so tickled his humour that he exclaimed "Similem habent labia lactucam"—"like lips like lettuce," as Dr. Bostock puts it.

[6] A more regular translation of "Diogenes Cynicus," which is the expression used by both Pliny and Solinus, would surely be "Diogenes the Cynic"; but there is a certain charm about Goldinge's crisp English.

[7] "Nunquam ructasse." "Rasp" is now almost obsolete in this sense, and sounds coarse to modern ears. It remains in use, however, to a small extent, in East Anglia; and Goldinge was an Essex man. It is probably onomatopoietic in origin.

[8] "Antonia non spuisse percelebre est." PER*celebre* be it noted! In our own times fame would be more apt to attend a lady in the contrary event. So also of Pomponius and his little eccentricity. But *tempora mutantur, nos et mutamur in illis.* These heroes were not

"Milo also of Croton is reported to have doone all thinges above the reache of Mans power. Of whõ this is left in wryting, that with the stroke of his bare fist, hee felled an Oxe starke dead, and eate him upp himselfe alone the same day that he killed him, without ouercharging his stomacke. Hereof

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entirely singular, however, for Pliny has the grace to add a saving clause, which Solinus omits—"Sed hæc parva (prava, Saumaise) naturae insignia in multis varia cognoscuntur." De Saumaise says that Varro, one of Rome's most polished scholars, stated that the Persian youth were accustomed, by means of practising self-restraint, and by judicious conduct and dieting generally, to steel themselves against the natural need to expectorate and blow their noses, studying to engender a healthy and "dry" habit of body. In other words, to avoid catching colds, whether of the bronchial or of the naso-pharyngeal order. This may have been comparatively easy of accomplishment in the genial climate and germ-free atmosphere of the Iranian tableland; but it seems a pity that the precise regimen adopted by these prototypes of Christian Scientists was not graven on tablets of basalt and handed down for our weal.

[1] Solinus writes: "Tritanum gladiatorem natura Samnitem." Pliny does not say a Samnite born, but "corpore vesco sed eximiis viribus Tritanum in gladiatorio ludo Samnitium armatura celebrem." That is, "Tritanus, [a man] puny in frame but having remarkable strength, famous in the gladiatorial contests [for his proficiency] with the Samnites' accoutrements." The allusion fails in point unless one bears in mind that the Samnites, who were a bold and freedom-loving race of highland rovers, were noted for their prowess in the arts of combat, and furnished many of the most successful gladiators to the Roman arenas. Tritanus may, therefore, well have been a Samnite by birth as well as training. Besides the customary short sword or cutlass, their equipment included an oblong shield or *scutum*, a high-crested helmet shaped something like that of a London fireman, a greave on the left leg, an apron, a gorget, and protective rings on the fighting arm.

[2] By "sinewes" are of course meant muscles. Their "cross overthwart" or "lattised" appearance, as here described, recalls the Belvedere torso of Herakles, whereon the prominences arising from excessive muscular development are very noticeable. The Apoxyomenos of Lysippos (athlete using a strigil), and the Wrestlers in the Uffizi Gallery, may be mentioned in the same category; whilst later examples of a similar muscular hypertrophy are seen among the works of Michael Angelo.

there is no doubt. For uppon hys Image is an inscription in witnesse of the facte, wyth these words: *Hee died a conqueror in all attempts.* Moreover, Milo flourished in the time of Tarquine the Elder."

Did he! one is tempted to exclaim. But it is time that we relegate Solinus to the enjoyment of his own jokes in that seclusion from which we have been fain to temporarily retrieve him, and to which his antiquity, if not his genius, affords him fair claim. Either the man was a wag, or his guilelessness was too touching for words. We have it on the authority of Livy (xxix, 14), that people in those days were *proni et ad nuncianda et credenda prodigia*—apt to tell snake stories, and to believe in them, to boot. Strabo (I, ii, 8) declares the same thing, and adds that not only childhood, but age as well, is influenced by the marvellous and the terrible; he held that such narratives by the poets incite men to deeds of virtue, and restrain them from vicious courses. The exaggerations of Antiphanes, a Thracian born at Bergé in that region, were so notorious, and the fame of his character for trumping up fables and incredible narratives so widespread, that things of that kind came to be spoken of as "Bergéan" stories; and the word *βεργαιζειν* was coined to express the habit of "drawing the long bow." We know, too, in what disdain Saint Paul held the people of Crete, who showed proclivities in the same direction and drew from him uncomplimentary epithets already applied to them by "One of themselves, even a prophet of their own" who "said 'The Cretans are alway liars, evil beasts, slow bellies.'"[1] And in our own day every person whose eye wanders over a newspaper, especially if he read the headings, finds evidence of this same craze for the marvellous, and for the dissemination of "Bergéan" stories in our midst even as was the wont of Antiphanes the Thracian. But after Solinus's recital of his last wonder, and the unanswerable, if unconvincing, arguments he brings forward in support of his veracity, I will not trench longer, gentlemen, on your patience, nor ask any further effort of your credulity.

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A Relic of the King's Evil in the Surgeon-General's Library (Washington, D.C.).

By Fielding H. Garrison, M.D.

In 1891, the Surgeon-General's Library acquired by purchase a folio volume containing twenty-two leaves in which are inserted the following items relating to the King's Evil:—

(1) A golden touch-piece of James II corresponding as to obverse and reverse, size and shape, with specimen No. 4, on the plate opposite p. 90 in Dr. Raymond Crawfurd's interesting monograph on the King's Evil (1911), and punctured at the top, like the latter coin.

(2) Inventories of moneys disbursed for healing medals, and registries of the number of persons touched for the Evil, during the reign of Charles I, Charles II, and Queen Anne. These MSS. are all written upon one side of quarto or folio sheets of paper, and are in the cursive script characteristic of the different periods. Some of them are fragmentary, halves of a sheet torn lengthwise, as if for destruction. At the bottom of each set of data is the signature of the particular accountant, and the records are vouched by the different "Clerks of the Closets." One of these fragmentary records bears, at the bottom near the right-hand corner, the signature of Richard Wiseman.[1]

The first leaf reads[2]:—

> "Moneyes issued at the Receipt of the Excheq^{r} for Angell
> Gold for the Kings Healinges By virtue of his late Ma^{ts} lrds

---

[1] Serjeant Surgeon 1665-1676. A list of "The Serjeant Surgeons of England and their office," by D'Arcy Power, F.S.A., appeared in *Janus* for 1900, p. 171.

[2] Colonel Walter D. McCaw, Librarian of the Surgeon-General's office, has very kindly helped me with his expert skill in deciphering these crabbed manuscripts.

of Privy Seals Dormant dated the ixth day of June in the iiijth yeare of King Charles the first

Termino Michls 1628	600	0	0
Pascha 1628	110	0	0
Michls 1629	200	0	0
Pascha 1633	550	0	0
Pascha 1634	350	0	0
Pascha 1635	600	0	0

The second leaf reads:—

"Baptist May Esq.^{r} for the service of healeing medalls./

Order is taken this xxii.th day of May 1680. By virtue of his Ma.^{ties} lrds of Privy seale dated the xx.th day of March in the xx.th yeare of his Ma.^{ts} raigne that you deliver and pay of such his Ma.^{ts} treasure as remaineth in yr. charge unto Baptist May Esq.^{r} keep. of his Ma.^{ts} Privy Purse or his Assignes the summe of three thousand pounds upon accompt for provideing Crowne Gold for healeing medalls for his Ma.^{ties} use in healeing and these together with his or his Assignes acquittance shall be yr. discharge herein——

Margin with signatures partly clipped off.

May's receipt follows on p. 3:—

xxijth die February 1691

Received then on an Order of y^{e} xvijth day of February 1691 By virtue of his Ma^{ts} Lrds of Privy Seale dated the xxth of March 1667 Off S^{r} Thomas Vernon Barr. one of the foure Collo:^{rs} of his Ma^{ts} Receipt of Excheq.^{r} By me Baptist May Esq.^{r}— Keeper of his Ma:^{ts} Purse the Sum̄e of Ninety five Pounds— sixteene shillings and three Pence in ptc of y^{e} sd Order of až až až upon Accompt for Provision for— Crowne Gold for his Ma.^{ts} use in healing—— —— —— —— ——

£ cc s d
iiij xx. xvi. iij
Ninety five pounds
Sixteen Shillings
and three pence.

Baptist May.

The fourth leaf has attached to it two large pen drawings of the gold touch-piece of Charles II, figured as specimen 3 on the plate opposite p. 90 of Dr. Crawfurd's book.

The fifth leaf has a steel engraving of four specimens of touch-pieces, obverse and reverse, published by John Churchill, Princes Street, Soho, and probably an illustration in some book.[1] All the specimens given in this engraving are described by Crawfurd.

The sixth is the right half of a vertically torn MS. page, being a registry of the number of persons healed from August 5, 1669, to December 22, 1669, signed by Wm. Paynter[2] and J. Knight,[3] and vouched by R. Crewe, "Clerk of the Closett."

The seventh is a similar registry, signed by Knight and *Ri.* Pike,[4] and vouched by N. Duresme[5] "Clerk of the Closett."

The eighth is an intact folio leaf and reads as follows:—

> "The number of Persons that have beene touched for the Evill and for many Meadalls delivered for that use and according to the following particulars wch amount to one thousand forty and two
>
> N. Oxon[6] Clerk of the Clossett
>
> August 25th 1671
> August 25th three... 003
> August 27 seaven 007
> Knight[3]
>
> Septembr 20 : 1671
> September 20th Eighty three 083
> September 29 Twenty two 022
> September 30 foreteene 014
> Knight[3]
>
> October : 1th : 1671
> October 1th fore 004
> October 13 sixty three 063
> Knight[3]
>
> November 3th 1671
> November 3th one hundred ninty one ... 191
> November 17 one hundred ninty nine ... 199
> Ri : Pike[4]

---

[1] The frontispiece to "On Superstitions connected with the History and Practice of Medicine and Surgery," by Thomas Joseph Pettigrew, F.R.S., F.S.A., Lond., 1844, 8vo.

[2] ? Humphry. Humphry Painter, Sergeant Surgeon, 1661-72.

[3] John Knight, Sergeant Surgeon, 1661.

[4] Richard Pyke, Sergeant Surgeon, 1642.

[5] Dunelm? The Bishop of Durham.

[6] Bishop of Oxford.

December 1th : 1671

December 1th one hundred fifty two	152
December 8 one hundred & two	102
December 15 sixty fore	064

Ri : Pike[1]

January 12th 1671

January 12 Tenn	010
January 22 fore	004

Ri : Pike[1]

February 2th : 1671

February 2th fifteene	015
February 7 Tenn	010
February 23 ninty nine	099

Knight[2]

The ninth reads :—

The number of Persons that have beene touched for the Evill and soo many Meaddalls delivered for that use are according to the ffollowing Perticulars from the Eight of June to the Thirteenth of December 1679 Seven hundred Twenty & Two

N. Duresme Clerk of the Clossett

June : 8th : 79

June 8th Twenty one	021
June 29 fourty three	043

Sackvill Whittle

July. 12.th 79

July 12.th five	005
July. 16. foure	004
July. 19. seven	007
July 25 Thirty foure	035

Sackvill Whittle

August : 15th : 79.

August 15th Nine	009
August. 17. foure	004

Sackvill Whittle

September. 11.th 79

September 11.th five	005
September. 14. seventy eight	078
September 22 five	005

Sackvill Whittle

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[1] Richard Pyke, Sergeant Surgeon, 1642.

[2] John Knight, Sergeant Surgeon, 1661.

October : 8 : 79	
October. 8.th seventy seven	077
October. 9. Two	002
October 24 foure	004
Sackvill Whittle	
November. 1.st 79	
November. 1st seven	007
November. 12 one hundred fifty foure ...	154
November 26 one hundred seventy two ...	172
Sackvill Whittle	
December. 9.th 1679	
December. 9.th one	001
December. 12. Ninty	090
Sackvill Whittle	

The tenth is the right half of a vertically torn leaf, like the preceding, vouched by N. Duresme, and the separate entries signed by Knight, Ri : Pile and (at the bottom) Ri : Wiseman.

The eleventh, another document of the reign of Charles II, reads :—

> Sr,
>
> The Lords Com^{rs} of his Ma^{ts} Treas^{r}y have directed the Com^{r} of his Ma^{ts} Revenue arising by Lycences to retayle wines to pay Six hundred pounds forthwith into the Receipt of his Ma^{ts} Excheq.^{r} It is their Lord'ps pleasure that the Said Sum be issued to Baptist May Esq.^{r} for healing medalls upon Such Warrant or order as their Lo^{ps} shall direct to you for ye Same.
>
> I am Sr
> Your most humble Serv^{t}
> Hen : Guy :

The twelfth, a document of Queen Anne's reign, reads :—

> Record 19 ffeb 1712
>
> ffeb^{ye} 23^{d} Recd of the Righ^{t} Hon^{le} Lord
> Dopplin fifteen hundred pounds
> being in further parte of an Order
> of twenty Six Thousand pound^{s}
> dated ye 18 Jan^{y} 1712 for the use £1500^{s}
> of her Majes^{ts} Privey Purse and for
> healeing Medalls
>
> Henry Hoare
> Witness Attorney to Lady Masham[1]
> John: Arnold

---

[1] Abigail Lady Masham, bedchamber woman to Queen Anne and cousin of the Duchess of Marlborough.

The thirteenth leaf consists of two large hand drawings of the bronze touch-piece of Charles I, figured as number two in the plate opposite p. 90 of Dr. Crawfurd's book.

The next pages are taken up with the separate leaves of the 1789 reprint of the pamphlet entitled "The Ceremonies For the Healing of them that be Diseased with the Kings Evil, Used in the Time of King Henry VII," originally published by Henry Hill, "Printer to the King's Most Excellent Magesty for his Household and Chappel" in 1686. The text of this has been transcribed by Dr. Crawfurd on pp. 132-136 of his work.

This is followed by the title-page of "Wiseman's Treatise of the King's-Evill" (1686), and pages 245-248, gutted out of this work.

The next item is a pamphlet of eight pages entitled "The Office of consecrating Cramp-Rings, 1694,"—a ritual very like the preceding.

The last item consists of five numbers of the *London Gazette*—viz., Nos. 4126-4128 (from Thursday, May 24, to Monday, June 4, 1705), each of which contains the following notice:—

"Her Majeſty having thought fit to put off Touching for the Evil for this Seaſon, it is Her Majeſty's Command, That all Perſons do forbear further Application, till publick Notice be given in the Gazette of Her Royal Pleaſure to Touch again.

"It is alſo Her Majeſty's Command, that all Perſons who ſhall then apply to be Touched, ſhall bring a Certificate to Her Majeſty's Serjeant-Surgeon, ſigned by the Miniſter and Church-Wardens of the Pariſh where ſuch Perſon ſhall then reſide, that they never had before received the Royal Touch, as has been heretofore accuſtomed."

No. 4172 (from Thursday, November 1, to Monday, November 5, 1705) contains the following:—

"It being Her Majeſty's Royal Pleaſure to Heal Weekly for the Evil during the preſent and succeeding Month till Chriſtmas, and to begin on Wedneſday the 14th Instant, it is Her Majeſty's Command, that all Perſons ſhall be viewed, and Tickets delivered the day before, at the Office in Whitehall appointed for that purpoſe, and no where elſe; and that all Perſons who apply ſhall bring a certificate, ſigned and ſealed by the Miniſter and Church-wardens of the Pariſh where they inhabit, that they never before received the Royal Touch."

And number 4185 (from Monday, December 17, to Thursday, December 20, 1705) as follows:—

"Her Majeſty having diſcontinued Touching for this Seaſon commands, That all Perſons do forbear Application till it ſhall be Her Royal Pleaſure to Heal again; of which publick Notice ſhall be given in the Gazette."

This bibliographical curiosity contains the gilt bookplate of Edward Hailstone of Waltonhall, Yorkshire, and was purchased at the sale of the second portion of his library (April 23 to May 1, 1891) by the then Librarian of the Surgeon-General's Office, the late Dr. John S. Billings. Dr. Billings took a deep interest in the subject of the King's Evil and has embodied the results of his collective investigations in a paper on "The King's Touch for Scrofula," read before the Charaka Club (1906).[1] In his introductory lecture on the history of medicine, delivered before the Lowell Institute of Boston, December 27, 1887,[2] he gives a large number of interesting examples of the effect of the mind upon the body, some of them taken from his own experience or personal knowledge, and, in connexion with this matter, the conclusion of his Charaka Club paper may be not uninteresting.

"Some difficult problems arise in connexion with the history of the Royal Touch for scrofula. Was the whole thing a delusion, or were many cures really effected? And if there were true cases, how were they brought about?

"And how did it happen that the gift of healing in this way by the kings of France and England was limited to this disease?

"The evidence that some cures were thus effected is as abundant and trustworthy as is that relating to any so-called miraculous cures or that relating to the efficacy of blood-letting, antimony and mercurials in acute febrile diseases as furnished by medical records prior to about 1850. And in saying this I wish to be understood as saying that it is evidence of no value whatever when all the circumstances are taken into consideration. No doubt some of those who were touched became better, or even may be said to have recovered. Wiseman's argument is the strongest one as to the connexion of this result with this ceremony. He says, 'For since it cannot be denied that many go away cured, some will impute it only to the journey they take and the change of air; others to the effects of imagination; and others to the wearing of gold (Metallotherapy?). The first of these is easily confuted by the hundreds of instances that are to be given of inhabitants of this city, who certainly could meet with little change of air, or indeed of exercise, in a journey to Whitehall. The second is as readily taken off by the examples of infants, who have been frequently healed.'

---

[1] J. R. Billings, *Proc. Charaka Club, N.Y.*, 1906, ii, pp. 58-71.

[2] *Boston Med. and Surg. Journ.*, 1888, cxviii, pp. 29-57.

"The choice of struma or scrofula as the special disease to be healed by royal touch appears to have been at first largely a matter of accident. If to-day we were to select a disease to be treated in this manner, we should probably choose certain forms of hysteria and epilepsy such as were in ancient times supposed to be cases of demoniacal possessions, and not any form of disease which we supposed to be due to micro-organisms. Yet it is well to bear in mind that, while we should act in accordance with what seems to us to be most probable, we have to deal with probabilities and not with certainties. It is a conceivable hypothesis that the cortical gray centres of perception and ideation may so act upon the vasomotor centres as through them to produce changes in function in glandular and other tissues, and thus to change the composition of albumoses and animal alkaloids contained in the fluids of the body; and, in fact, we have some evidence, that this does sometimes occur. But, if this be possible, it is then also quite possible that by such changes the environment of living tissue may be made either more or less favourable to the development of certain micro-organisms, or that toxic products may be thus either neutralized or increased, with corresponding effects as regards immunity or progress of disease."[1]

Note by Dr. Raymond Crawfurd.—We have in this composite volume an interesting addition to the literature of Touching for the King's Evil. The collection of materials appears to have been made by someone interested in the royal ceremonies of healing, perhaps with the intention of writing some account. The fragments do not, however, appear to be the framework of any published account. It would be helpful if Dr. Garrison could narrow down still further the period of collation, which intrinsic evidence shows to have been somewhere between 1789 and 1891 A.D. The fragments confirm the information that we already possess, and supply also some additional detail; this is more particularly the case with regard to the Queen Anne period. Folio xiii is of special interest, showing as it does that the compiler possessed the knowledge of the existence of a bronze touch-piece of Charles I, for the first public announcement of which (*Numismatic Chronicle*, 1910) we are indebted to Mr. Henry Symonds.

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[1] *Op. cit.*, 69-71.

Account of a Group of Medical and Surgical Instruments found at Kolophon.

By W. H. BUCKLER and RICHARD CATON, M.D.

SURGICAL instruments of Greek or Roman origin have been found at various places in Europe, Asia Minor and North Africa, and are preserved in museums in Naples, Rome, Athens, Paris, London and elsewhere.

Hippocrates, Rufus, Celsus, Galen and other writers, down to the days of Paulus Ægineta, make reference to such instruments, and by comparison of the finds with the records we may form some conception of the methods of our professional brothers of two thousand years ago.

This special group of instruments belongs to Mr. W. H. Buckler. He was kind enough to allow them to be shown to the Section, and he gave a brief description of their discovery at Kolophon, in Ionia. With two exceptions all the articles are of bronze. The several items are as follows:—

Slab, of Egyptian porphyry, 12 cm. by 7·5 cm. This slab, doubtless, was for mixing the solids of the Materia Medica. The slab was bevelled on one side and polished on the other. It is marked No. 1 in fig. I.

Balance.—A well-constructed pair of scales, still in excellent equipoise. The beam is 30 cm. in length. It was supported by a central hook. The pans are cup-shaped, about 1·4 cm. in depth and 6·7 cm. in breadth. Each is suspended from the beam at four points, instead of the three in use in modern times. No. 2, fig. I.

Cupping Vessels.—Three well-preserved *σικύα*, or cucurbitula, of different sizes were found. They are of the usual shape. The method of application was by igniting a piece of dry linen in the fundus of the cup. The cup was then applied to the skin. As the heated air within cooled it contracted and sucked the skin into the neck of the cup. Cup No. 3 is about 11·5 cm. in height, 9·2 cm. in breadth. No. 4 is 10·7 cm. by 6·7 cm. No. 5 is 9 cm. by 6·3 cm. For convenience of hanging, a ring was usually soldered to the cone-shaped apex of each cup. Traces of this arrangement remain, but the rings and their attachment are lost.

Knives.—In ancient times knives were either of stone or of bronze. The superstitious fear of iron lingered even into the Christian era. It

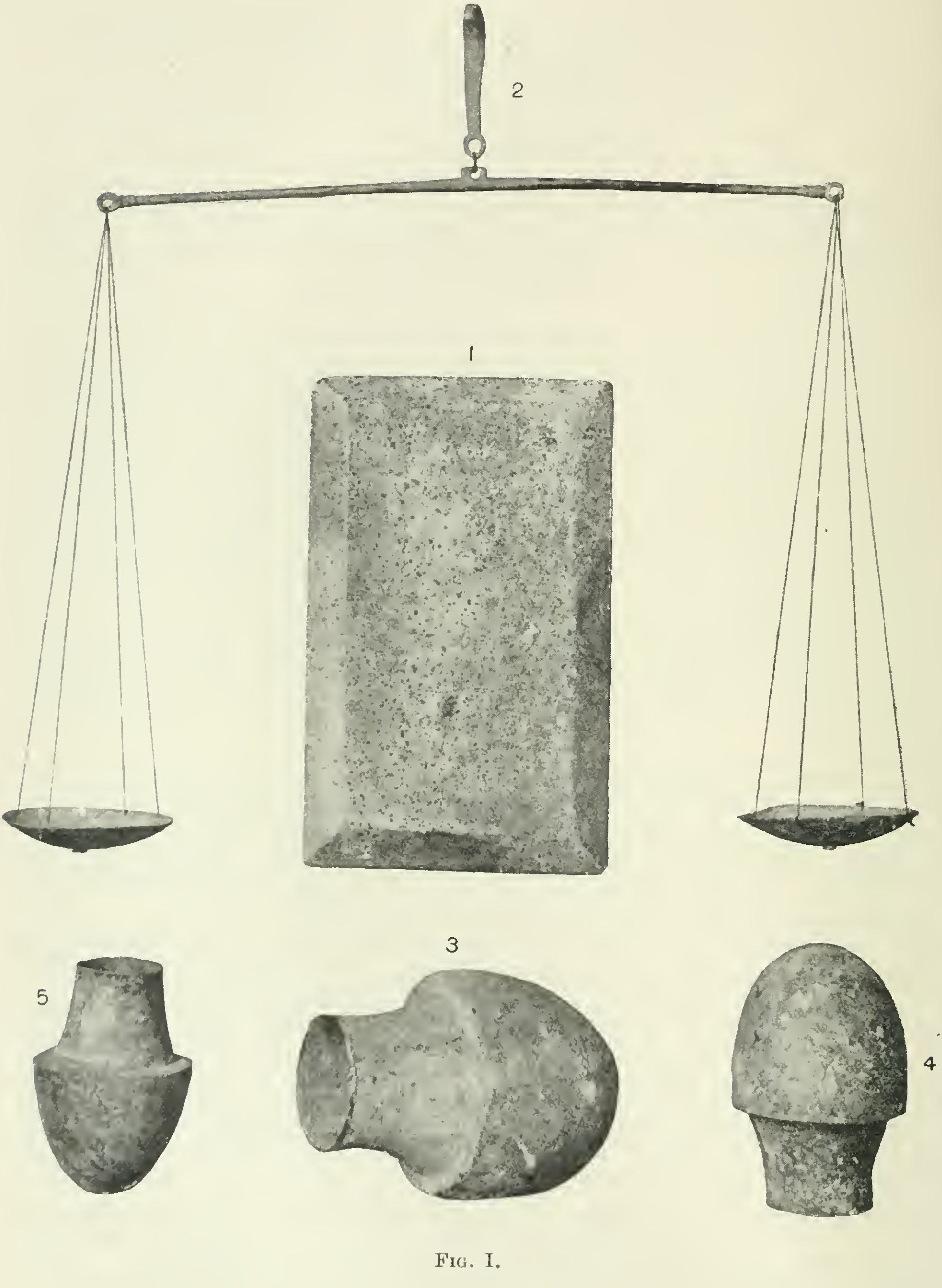

Fig. I.

was unlawful to introduce an iron implement into any Greek temple.[1] Bronze, on the other hand, had a special purifying virtue.[2] In Rome it is well known that no iron was allowed to be used in the construction or repair of the Sublician Bridge. No Roman priest might be shaved by an iron razor or iron scissors.[3] I mention this superstition as possibly explaining a peculiarity to be observed in surgeons' knives. It will be remembered that surgical treatment was related to the worship and ritual of Asklepios. Fig. II shows the remains of two knives, A and B (copied by permission from the excellent treatise on Greek or Roman surgical instruments by the late Dr. Milne). The steel blades here remain, though much altered in shape by rust. C and D are restorations, showing two out of the many types of surgical knife. It will be noticed in these four cases that the handle consists of a squared central part, beyond which, at the part remote from the steel blade, a leaf-like projection extends. This is, in fact, a sort of bronze blade, and the two edges are in some cases fairly sharp. Whether this part of the instrument was retained for use as a sort of blunt dissector, or whether it is a ceremonial survival of the ancient bronze cutting blade, may be uncertain. I suggest the latter explanation. It was not for the operator a comfortable or convenient handle. C represents a double-edged scalpel or *φλεβότομον* or *κατειάς*; D is the convex single-edged scalpel or *στηθοειδής*. Mr. Buckler's collection includes six knives of the above type (fig. III, Nos. 6 to 11). In No. 7 (which is shown in

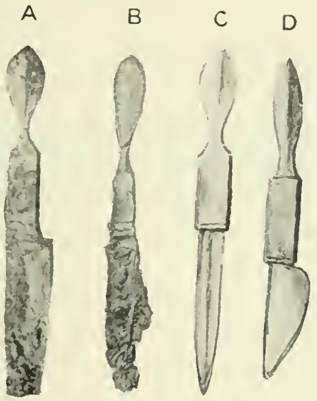

FIG. II.

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[1] Plutarch, "Precepta. ger. reipub.," xxvi, 7.

[2] Scholiast on Theocritus, ii, 36.

[3] Macrobius, Sat. v, 19.

profile) the groove is well seen in which the base of the steel knife was secured. Nos. 12 and 13 are rounded handles, and No. 14 is another form of the same, formerly holding some steel instrument, perhaps a knife-blade. Probably among these knives may have existed the *κατειάδιον*, a long slim blade, and the shorter and stronger *λιθότομον*. These objects vary from 7·5 cm. to 12·5 cm. in length.

Bow-drill (?).—The instrument numbered 15 has been somewhat difficult to explain. In all probability it is a folding bow-drill for driving a trephine. No. 15A shows the drill opened out, and the cord attached to and stretched between the two apertures at *a* and *b* at the extremity of the arm *e*. The total length of the drill is 39 cm., and the length of the cord 26 cm. Hippocrates,[1] Celsus,[2] Galen[3] and other writers speak of the use of this instrument in injuries and diseases of the skull and larger bones. The drill itself, the *πρίων* of Hippocrates and *τρύπανον* of later writers, a straight steel or bronze rod, having a rotating handle at its upper end, and a sharp steel auger or a circular saw at the lower, had a turn of the cord passed tightly round it. The operator holding the rotating handle placed the auger or saw on the bone to be perforated, and by a rapid to-and-fro movement of the bow-drill caused a quick revolution of the auger and speedy perforation of the bone. When a circular piece of bone was to be removed, a short steel tube with teeth on its lower edge was used in place of the auger; this was termed *κοινικίς*. The bow-drill is similar to the tool used by carpenters in ancient and modern times. Examples of the special form used by Greek or Roman surgeons are rare. The British Museum possesses one, though its nature and purpose were never ascertained until the discovery of Mr. Buckler's specimen. The example from the British Museum is shown at 15B. The hinged piece *e* has been broken off near the joint, hence it was difficult to identify until a complete specimen could be used for comparison. We are indebted to Mr. A. H. Smith for permission to photograph the Museum specimen; he first noted its identity with No. 15 of Mr. Buckler's collection.

Cautery.—No. 16 is probably a bronze cautery, or *καυτήριον*. Its length is 16·8 cm., and the breadth across the part to be heated is 3 cm. There is just a possibility that it is a *γλωσσοκάτοχος*, or tongue depressor, but I think that is improbable.

Scoop or Curette.—Specimen No. 17 is of much interest. It is a

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[1] Hipp., ΠΕΡΙ ΚΕΘ ΤΡΩΜ (Van der Linden) xxviii.

[2] Celsus, viii, 3.

[3] Galen (Kühn), x, 445.

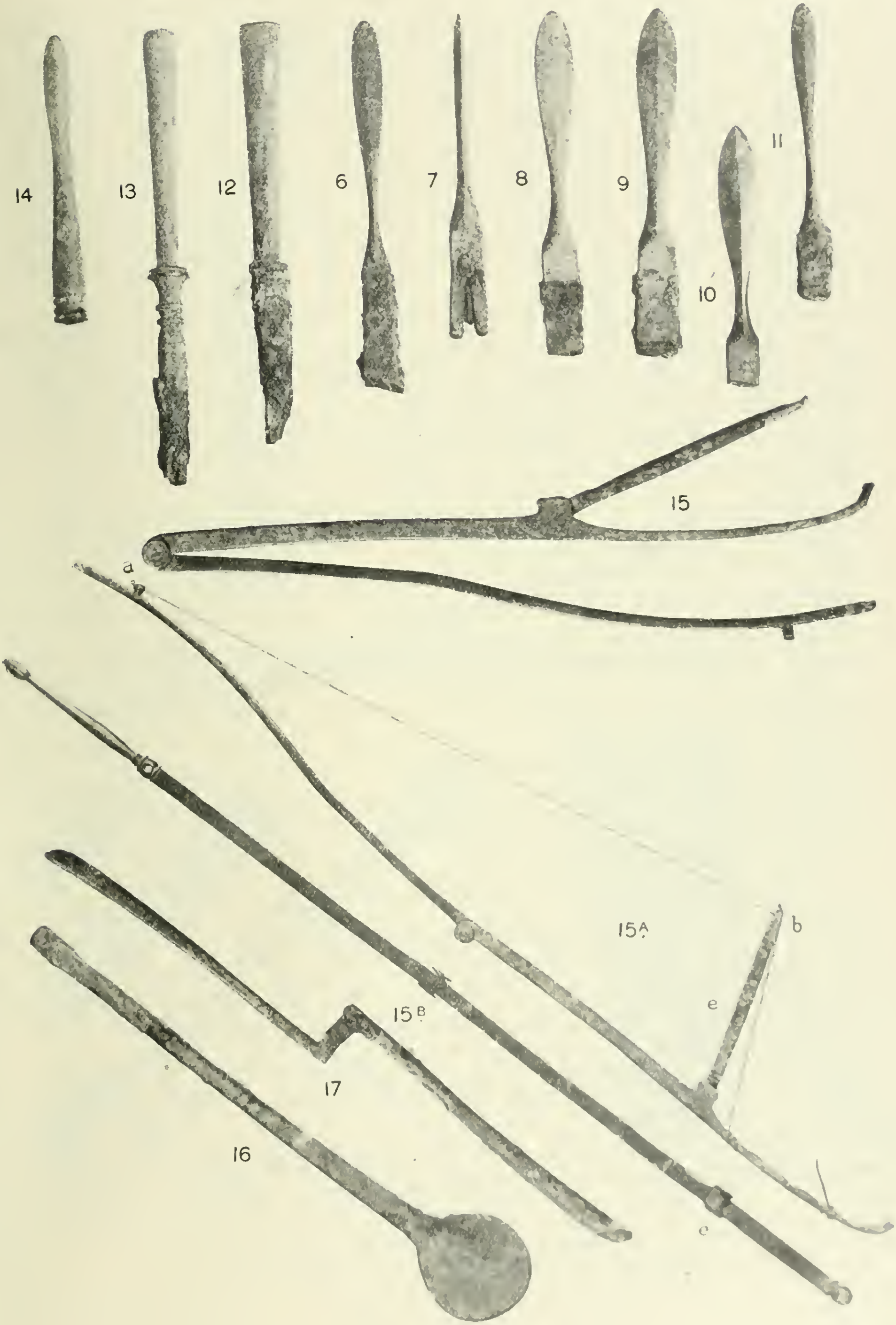

FIG. III.

double scoop, or *κυαθίσκος*, measuring 19·5 cm. in length. The one scoop is toothed at its extremity, the other is smooth. On cross-section the hollow of each scoop is seen to be formed, not by a curve, but by five planes meeting one another at equal obtuse angles. The two scoops, each 9·75 cm. in length, are joined together by a cross piece 1·5 c.m. in length at right angles. This arrangement permits a strong hand-grip on the instrument. Gynæcologists whom I have consulted tell me this double scoop may be intended for, and could be used as a uterine curette. Hippocrates[1] speaks of such an instrument (*ξύστρα*) being used for disease of the os uteri.

Probes.—Nos. 18 and 19 in fig. IV are good examples of the probe, *μήλη*, or specillum. No. 18 is exactly like a probe of to-day; it has the two olivary thickenings at the ends, and is what Galen[2] would have called *διπόρηνος μήλη*. Length, 15·7 cm. No. 19 has no olivary enlargement at either end, but presents a small round flat disk about 6 mm. in diameter at one extremity; length, 17·2 cm.

Forceps.—No. 20 is a lengthy and beautifully made instrument, 19·5 cm. long. The handle is in part formed of two dolphins. This may be an example of the *πολυποξύστης*, or polypus forceps. The "bite" of the teeth is strong and close. Nos. 21 and 22 are two pairs of strong forceps, possibly *τριχολαβίς*, or epilation pincers (14·5 cm. in length), but applicable for many purposes. In each case the one prong has a semicircular prominence, which accurately fits a corresponding hollow in its fellow. No. 23 is a lighter pair, one prong of which has been lost, 14·2 cm. in length. No. 24 is a strong *ὀστάγρα*, or bone forceps, with artistically modelled handles. The blades present teeth which grip firmly. Size, 22 cm. This type of forceps was often needed for the extraction of arrow and lance heads.

Tenacula.—No. 25 is a beautiful example of a double *ἄγκιστρον*, or sharp hook. The handle is formed of turned bronze. The two limbs twist round one another spirally. Size, 16·5 cm. Nos. 26 and 27 are two single sharp hooks, both decorated. Size, 16·3 cm. No. 28 is an example of *τυφλάγκιστρον*, the blunt hook. Size, 11·6 cm.

Elevator.—No. 29 appears to be a powerful elevator or lever, the "vectis" of the Romans, for raising depressed bone. One end has been broken, and is lost. Size, 15·6 cm.

Catheters.—The *καθετήρ*, or fistula ænea of Latin writers. No. 30 is an excellent example of a full-sized male catheter, having an aperture

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[1] Hipp., ΠΕΡΙ ΓΥΝΑΙΚ ΘΥΣ (Van der Linden), xxxvi.

[2] Galen (Kuhn), ii, 581

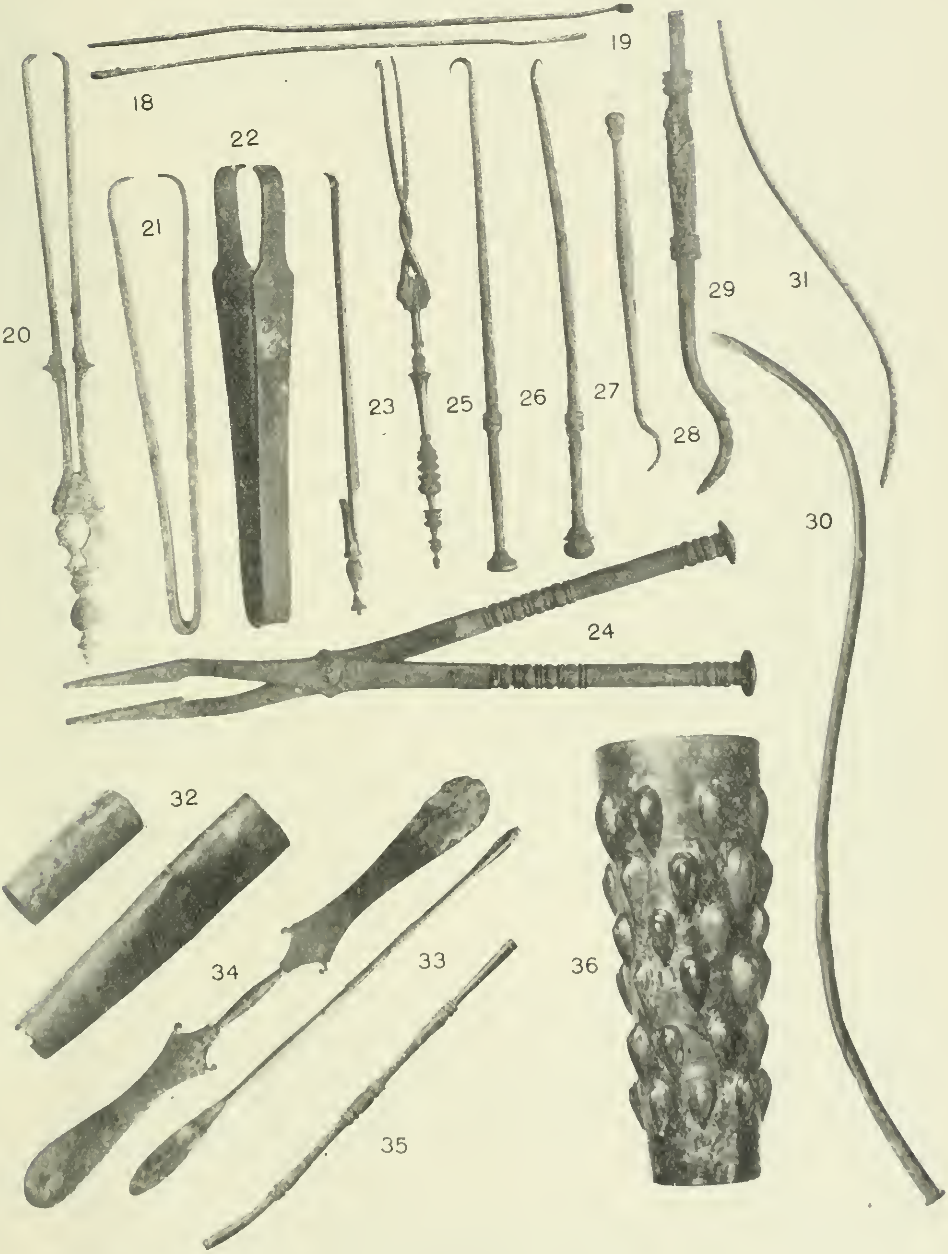

FIG. IV.

or eye at its lower point, and a projecting edge at the upper end, as in modern instruments. It has the usual S-shaped curve commonly adopted in Græco-Roman times. Length, 32·2 cm.; breadth, 6 mm. No. 31 is a portion of a smaller catheter, 16·5 cm. in length, 3 mm. broad.

Bronze Box, for small instruments or medicaments, 15 cm. by 2·2 cm., No. 32 in plate.

Spatulæ.—No. 33 is a good example of the σπαθομήλη, or spatula having an olivary probe at its other end. Its length is 16·8 cm., and the breadth of the spatula end is nearly 1 cm. The spatula is slightly concave, or spoon-shaped. No. 34 is a large double spatula, with a central decorated handle. Length is 19·5 cm., the breadth of the spatulæ being 1·5 cm. They are slightly concave, one more so than the other.

Needle-holder (?).—A bronze rod, 13·75 cm. in length, decorated by three bands of turned ornament, No. 35. At each end an aperture about 1·5 cm. deep. This looks like a needle-holder. The rod is curved at one end, either with a purpose or accidentally.

Beaker.—A decorated purple glass beaker, No. 36, 25·5 cm. high and 10·5 cm. broad at the brim, was found with the instruments. Its function probably was not medical. It may have been the drinking cup of the physician, or the vessel used for pouring libations at his tomb.

The date of these objects is uncertain, probably about or not long after the Christian era.

I desire to acknowledge the great help obtained from the late Dr. Milne's "Surgical Instruments of Greek and Roman Times" in preparing this paper. Mr. Forsdyke, of the British Museum, kindly superintended the reproduction of the instruments by photography.

It is owing to the courtesy of the Society for the Promotion of Hellenic Studies that this paper and the illustrations appear in the *Proceedings*.

Dr. PARKES WEBER said that the custom of burying valuable property with dead bodies doubtless was originally connected with the idea of a life after death. Offerings of food, wine, &c., were made at tombs in Græco-Roman times. The beautiful glass goblet found in the physician's tomb, which Professor Caton described, was probably buried with him in connexion with the almost universal traditional custom arising from the belief in a future existence.

Mr. WILLIAM BUCKLER and Professor RICHARD CATON also showed a collection of Greek and Roman surgical instruments made by the late Dr. J. Stewart Milne, of Hartlepool.

Section of the History of Medicine.

May 27, 1914.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

Dr. Thomas Spens: The First Describer of the Stokes-Adams Syndrome.

By C. E. Lea, M.D., M.R.C.P.

I wish to direct attention to what I have little hesitation in naming as the first undoubted case of the syndrome now known as the Stokes-Adams disease described by a British writer. The case was published in the year 1793 by a Scottish physician, resident in Edinburgh, named Thomas Spens.

I propose to note, firstly, the evidence which establishes the priority of Dr. Spens's case over those previously held to have been the first described; secondly, to epitomize, in the words of the actual text of the description, the features of the case which clearly denote its character as a true instance of heart-block, with its associated syncopal and epileptiform attacks; and finally, to mention what I have been able to find out about this Dr. Spens, whose name in this association ill deserves the oblivion of 120 years.

Early Records of Heart-block.

Robert Adams, of Dublin, reported, so it is claimed, the first clear case of heart-block in 1827. In the same year a similar case was reported in great detail by Dr. William Burnett, who also called attention to the fact that Morgagni had described two cases of "epilepsy with slow pulse" in 1761. In 1841 Holberton described another case, but general attention was not directed to this condition until William Stokes, also of Dublin, published four cases in 1846.

It will be seen, then, that Dr. Spens's case precedes all these instances, with the exception of Morgagni's. Spens's case precedes Adams's and Burnett's cases by thirty-four years, Holberton's by forty-eight years, and Stokes's cases by fifty-three years.

DESCRIPTION OF THE CASE.

The account of the case is to be found in a book of some 592 pages, entitled "Medical Commentaries for the year MDCCXCII." Succeeding this title it states, "Exhibiting a concise view of the latest and most important discoveries in medicine and medical philosophy, collected and published by Andrew Duncan, M.D., F.R. and A.SS.Ed." The book was published in the year 1793 in Edinburgh. Mr. Graham, the Librarian of the Royal College of Physicians of Edinburgh, tells me that this publication was begun in 1773 under the title, "Medical and Philosophical Commentaries by a Society in Edinburgh," and there were twenty volumes in all (1773-95). With the seventh volume the title changed to the one above mentioned. Each volume has a separate dedication to some person of rank or quality of the time. The 1793 volume is dedicated to Dr. Thomas Fowler, of York.

The case is to be found commencing p. 458 and is entitled, "History of a case in which there took place a remarkable Slowness of the Pulse." "Communicated to Dr. Duncan by Dr. Thomas Spens, Physician in Edinburgh." It begins:—

> "On the 16th of May, 1792, about 9 o'clock in the evening, I was sent for to see T. R., a man in the 54th year of his age, a common labouring mechanic. . . . I was much surprised, upon examining the state of his pulse, to find that it beat only twenty-four strokes to the minute. These strokes, however, as far as I could judge, were at perfectly equal intervals, and of the natural strength of the pulse of a man in good health. He informed me, that about three o'clock in the afternoon, he had been suddenly taken ill while standing in the street; that he had fallen to the ground senseless; and that, according to the accounts given him, by those who were present, he had continued in that state for about five minutes. . . . From the time of his first attack till I saw him, he had been affected with three other fits, mainly of a similar nature. These, however, were attended with some convulsive movements of his limbs, and with screaming during the fit . . . nor had he, at any time, any other complaint. . . . Upon visiting him on the morning of the 17th, I found that he had been attacked with several fits during the night . . . Upon examining his pulse I found that it beat only twenty-three beats in the minute . . . an hour after, I found it in precisely the same state as before.

He was now directed to take some spirits of hartshorn; but, by mistake, it was given him very little diluted, and produced much uneasiness in his throat and mouth. From this cause I found him in great distress at one o'clock: but it seemed to have produced no change in the state of his pulse, which at this time beat twenty-four strokes in a minute and was of the same strength and regularity as before. . . In the morning of the 18th I was informed that . . . he had been frequently faint . . . his pulse beat only twenty-six strokes in in the minute. About 8 in the evening he had no sooner smelt it (newly toasted bread) than he felt some of the sensations of a beginning fit: and, as soon as he had tasted it he almost instantly cried out, and fell back senseless, with smart convulsions of all his muscles. He apparently recovered in a few seconds; but hardly any pulse could be felt for a good many seconds. On the morning of the 19th I learnt that . . . he had been attacked with frequent fits, attended with violent convulsions . . . at three in the afternoon, I found that it (the pulse) beat only ten strokes a minute, though it still continued equally strong and regular as before . . . he expired on the 20th. The day after his death the body was opened by Mr. Fyfe, and, upon the most careful examination, no morbid appearance of any consequence could be discovered either in the thorax or abdomen."

All the features of the case point to its being an undoubted example of heart-block. The slow, regular pulse, the occasional faints, losses of consciousness, and convulsions, during which, if prolonged, hardly any pulse could be felt, are typical. Especially to be noted is the unaffected state of the pulse, even following the distress of the too strong hartshorn; this static character of the pulse under varying circumstances being a striking feature of heart-block. Dr. Spens finally has evidence that two years previously the pulse of the patient presented no abnormality.

DR. THOMAS SPENS.

For what information I have been able to gather about this celebrated physician I am indebted to Dr. Byrom Bramwell, W. G. Spens, Esq., his grandson, Dr. Graeme Dickson, his grand-nephew, and T. H. Graham, Esq., the Librarian of the Royal College of Physicians of Edinburgh, and I would here express my thanks for their courtesy and kindness.

Dr. Thomas Spens was a distinguished Edinburgh physician. He was the second son of an equally distinguished physician, Dr. Nathaniel Spens, a gentleman who, apparently, was also well known as an archer, for he was a member of the Royal Archers (King's Bodyguard for Scotland), and his picture, painted by Raeburn, hangs now in the Royal

Archers' Hall, in Edinburgh. His son, Thomas, became also a member of the Royal Archers, and the same year was elected a Fellow of the Royal College of Physicians, at the early age of 25. He appears to have served the College well, for we find him successively Librarian, President, and, for the last thirty-three years of his life, Treasurer. He was an ordinary Physician of the Royal Infirmary, Edinburgh. His known published works are few, six in number, including his M. D. thesis, dedicated to his father. Its subject was "De Amenorrhœa." Three of his papers dealt with cardiac conditions. He died in Edinburgh in the year 1842.

Of any traits in his character, or of his personal appearance, I am unable to find anything ; but we can imagine that he was not without a certain pride in his ancestry. It may be assumed that this quality was at any rate present in his father Nathaniel, for we find that, after a long career in Edinburgh, he was enabled to redeem a portion of the family estate of Craig Sanquhar, in Lathallan, Fife, which had been sold by one Alexander Spens, three hundred years previously. To this eyrie Nathaniel, of whom we are told from one source that "he early practised as a surgeon, but later became (!) a Physician," and from another source that "he appeared to have been more famous as an Archer than as a physician," in due time hied himself, and was gathered to his fathers at the ripe and honourable age of 88. Not all the family estates, however, had been thus alienated, for Dr. Thomas Spens's grandfather had lived at Lathallan. Should further proofs of the distinguished ancestry of Dr. Thomas Spens, the discoverer of the first case of heart-block, be required, there is evidence that they claimed descent from the ancient Earls of Fife, and it is certain that they bore on their arms the lion rampant of the Macduffs.

Dr. Thomas Spens never lived on the lands of his ancestors. He died, where he had lived, in Edinburgh. He had the luck to be born a second son, so his elder brother, Colonel Spens, resided at Lathallan, and Thomas remained in the grey city till he passed away at the age of 79.

Dr. H. D. ROLLESTON asked whether eponymic disease ought to be called after the first recorder of a case or after the person who described the condition so fully as to draw public attention to the condition.

Notes on the Early History of Microscopy.

By Charles Singer, M.D.

In view of the immense interest in microscopic investigation evinced during the last fifty years, it is remarkable that no exhaustive history of the instrument has yet appeared. Many points in the earlier history of the subject remain doubtful, and in spite of the helpful essays of P. Harting[1] in Holland, of Landsberg[2] and Petri[3] in Germany, and of Vincenzo Rocchi[4] in Italy, there are still gaps in existing accounts. English literature on the subject is particularly scanty.[5] We have, therefore, endeavoured in the following pages to place before the reader a short and consecutive account, giving especial attention to the recorded observations of some of the earliest workers.

(I) The Simple Microscope.

The use of lenses may be certainly traced back to the thirteenth century, and is not improbably of far earlier origin. It seems likely that spheres of glass filled with water were used as magnifiers by the gem cutters of antiquity, whose work could hardly have been accomplished without some aid to vision. Pliny[6] mentions that burning-glasses were used by physicians as cauteries. "Letters, however small and dim," says Seneca[7] (*c.* A.D. 63), "are comparatively large and distinct when seen through a glass globe filled with water." The Indian drama "Sākuntalā"[8] of Kālidasā also distinctly refers to burning-glasses.

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[1] P. Harting, "Het Mikroskoop, deszelfs gebruik, geschiedenis en tegenwoordige toestand," 3 vols., Utrecht, 1848-50.

[2] C. Landsberg, *Central Zeitung f. Optik u. Mekanik*, 1890, p. 272 (unfinished).

[3] B. J. Petri, "Das Mikroskop," Berl., 1896. Historical introduction.

[4] Vincenzo Rocchi, "Appunti di Storia Critica del Microscopio," *Rivista di Storia Critica delle Scienze Mediche e Naturali*, January, 1913, anno iv, p. 1.

[5] There are, however, the Cantor Lectures of John Mayall, published in the *Journal of the Society of Arts* for 1886. Professor L. C. Miall has also dealt with much learning on the classical microscopists in his work on "The Early Naturalists," Lond., 1912.

[6] C. Plinius Secundus, "Naturalis Historia," xxxvi, p. 67 and elsewhere.

[7] Lucius Annaeus Seneca, "Quaestiones Naturales," book i, ch. vi.

[8] Kālidasā, "Sākuntalā," act ii. Orientalists usually date this work between A.D. 300 and A.D. 600.

The general principles of reflection with some idea of the refraction of light, and notably the optical properties of curved mirrors, were comprehended by Euclid (or at least by a writer using his name) in the third century B.C. as well as by the mathematician Ptolemy, in the second century A.D. The knowledge of these writers was handed on to mediæval Europe by the Arab, Alhazen (died 1038), who developed the ideas of his predecessors as applied to curved mirrors in considerable detail and with great mathematical skill. Alhazen was aware of the action of reflecting surfaces, formed by the rotation of a conic section, and he was, therefore, able accurately to project magnified images.[1] His work was familiar to at least two thirteenth century writers on optics, Vitello or Witelo, who attempted to use segments of glass balls to get a better view of small objects, and Roger Bacon, who had a clear conception of the simple microscope and of the possibility of bringing distant objects near and of indefinitely magnifying minute objects, by giving suitable direction to refracted rays and by the use of appropriate media.[2]

In Europe the invention of convex glasses for use as spectacles is attributed to Salvino d'Amarto degli Armati, of Florence, and to Alessandro de Spina, of Pisa, about the year 1300.[3] The first mention of these instruments is, however, said to be by Bernard de Gordon (died *c.* 1307) in his "Lilium Medicinæ."[4] It is remarkable, although fully in accord with what we know of the absence of mediæval interest in "phenomena," that such magnifying lenses do not seem to have been used for the investigation of Nature.

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[1] The earliest printed edition of Alhazen's "Thesaurus Opticae" is the Latin translation, probably by Gerard of Cremona, of 1542. Another edition, combined with the "Optics" of Vitello, appeared in 1572. For an analysis of the mathematical knowledge of Alhazen, see Moritz Cantor, "Vorlesungen über Geschichte der Mathematik," Leipz., 1880, i, p. 677.

[2] For Roger Bacon's knowledge of optics see "The 'Opus Majus' of Roger Bacon, with Introduction," by J. H. Bridges, Oxf., 1897, p. lxix *ff.*, and parts iv and v of the "Opus Majus" itself. Also E. Wiedemann and S. Vogl in "Roger Bacon, Essays . . . . collected and edited by A. G. Little," Oxford, 1914.

[3] *See* Hörner, "Ueber Brillen aus alter und neuer Zeit," 1885; P. Pansier, "Histoire des Lunettes," Par., 1901; E. Bock, "Die Brille und Ihre Geschichte," Vienna, 1903; Du Bois-Raymond, "Zur Geschichte der Glass Linsen," 1905; Hirschberg, in "Geschichte der Augenheilkunde," Leipz., 1906, Buch ii, Teil 2; B. Laufer, in "Mitteilungen zur Geschichte der Medizin und Naturwissenschaften, 1907, vi, p. 379; E. H. Oppenheimer, "Die Erfindung der Brille," in *Zentralzeit. f. Optik u. Mechanik*, 1908, p. 13; R. Greeff, "Die ältesten uns erhaltenen Brillen," in *Arch. f. Ophthal.*, Wiesb., 1912, lxxii, pp. 44-51. The rôle of Salvino d'Amarto and Alessandro de Spina has been recently rediscussed by Vincenzo Rocchi, "Appunti di Storia Critica del Microscopio," in the *Rivista di Storia Critica delle Scienze Mediche e Naturali*, January, 1913, anno iv, No. 1, p. 4 *ff.*, and by G. H. Oliver, in the *Brit. Med. Journ.*, 1913. It is alleged that, among the Chinese, spectacles were already being used in the thirteenth century. See, however, Hirschberg in "Mitteilungen zur Geschichte der Medizin," 1907, vi, p. 550.

[4] Written about 1300. First printed, Venice, 1496.

In the sixteenth century, however, curiosity in scientific matters began to assert itself. That universal genius, Leonardo da Vinci (1452-1519), had already investigated some of the effects of concave, as well as of convex, glasses,[1] while those interested in alchemy frequently used flasks filled with water, concave mirrors or else glass balls to concentrate rays of the sun.[2] Moreover, some of the optical properties of lenses were enunciated by Maurolico[3] (1494-1575), and later by Kepler[4] (1571-1630). Long before the dawn of the seventeenth century the principle of the lens was both comprehended and applied to scientific matters by the Englishmen, Leonard Digges and his son Thomas, and by the Italian, Giambattista Porta.

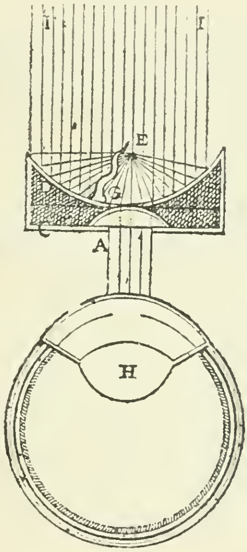

FIG. 1.

Descartes' diagram of a simple microscope from his "Dioptrique" of 1637.

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[1] *See* Otto Werner, "Zur Physik Leonardo da Vincis," Berl., 1911, p. 142.

[2] *See*, e.g., Conrad Gesner's "Thesaurus Euonymi Philiatri de Remediis secretis," Zurich, 1554, p. 100.

[3] Francesco Maurolico, "Photismi de lumine et umbra ad perspectivam radiorum incidentium facientes," Venice, 1575.

[4] Johannes Kepler, "Astronomiae Pars Optica," 1604, and "Dioptrice," Augsburg, 1611.

Interest in the minute structure of natural objects appears to have especially developed towards the end of the sixteenth and during the first third of the seventeenth century. Thus, it is likely that the naturalist Thomas Mouffet had used magnifying glasses for his researches on scabies as early as the year 1590,[1] and in 1637 Descartes described in his "Dioptrique" a somewhat elaborated form of the unilenticular microscope, with which rays of light are focused on the object by means of a concave mirror. There is a central transparent area in the mirror behind which the lens is placed (fig. 1).

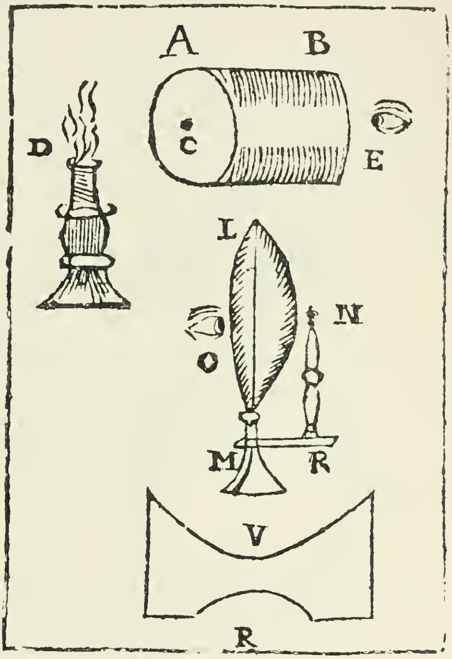

FIG. 2.

Kircher's diagram of a simple microscope (upper figure) from his "Ars Magna Lucis" of 1646, p. 835. The insect to be examined is placed on the glass plate at C and illuminated by the candle D, the lens being at the opposite end, E, of the tube A B.

With the process of development of the compound microscope we shall deal in the next section. It is here sufficient to say that the simple microscope was a natural development of the lens, but that even early microscopic pioneers, such as Fontana and Borel, availed themselves of the increased magnifying power produced by the compound system. With the improvement in the grinding of glasses, however, workers avoided the chromatic aberration and extremely small field of the compound instrument by reverting to the single lens. It was, indeed, mainly with such simple microscopes that the early historic microscopic discoveries were achieved.

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[1] See his "Insectorum sive minimorum animalium theatrum," Lond., 1634. Posthumously edited by T. T. de Mayerne.

The earliest microscopes consisted of a short tube of opaque material, with a lens at one end, and at the other a flat glass plate on which the object to be examined was placed. Such simple instruments were sometimes spoken of as "Vitrea pulicaria," or "Vitrea muscaria," from their use in the examination of small insects. Subsequently they came to be known as "Engyoscopes," and are spoken of as childish instruments, "Microscopia ludicra," as opposed to the compound "Microscopia seria."[1] We give a figure of an instrument of this type as at first used by Athanasius Kircher (fig. 2). By 1663 well-made instruments of this form were in common use in Holland. Thus at

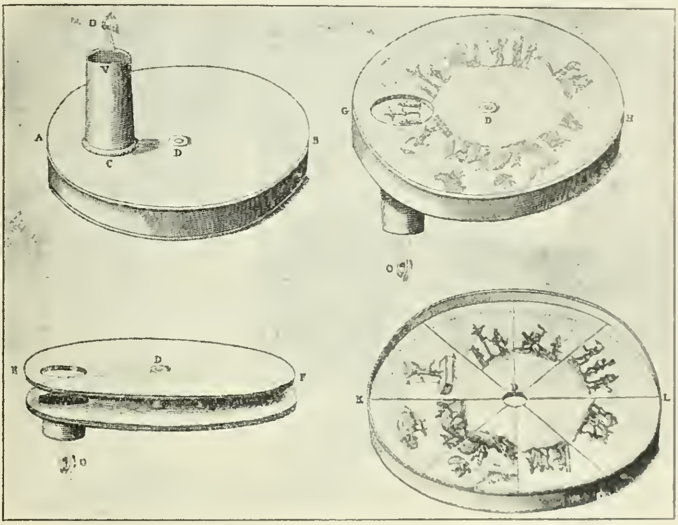

FIG. 3.

Kircher's "Smicroscopium parastaticum."

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[1] Johannes Zahn, "Oculus Artificialis," Herbipoli, 1685, iii, p. 109.

Leyden in that year Isaac Voss, of Hamburg, showed Monconys his microscope, "which is but a minute hemispherical lens, fixed in a small piece of wood, which is let into a little black table. The hollow for the eye is pierced by a very small hole."[1] A slight advance on this form was later adopted by Kircher. He had a series of objects mounted upon a rotating disc, which thus brought one after the other in front of the eye. This instrument he speaks of as the "Smicroscopium parastaticum" (fig. 3).[2] But the great improvement made with instruments

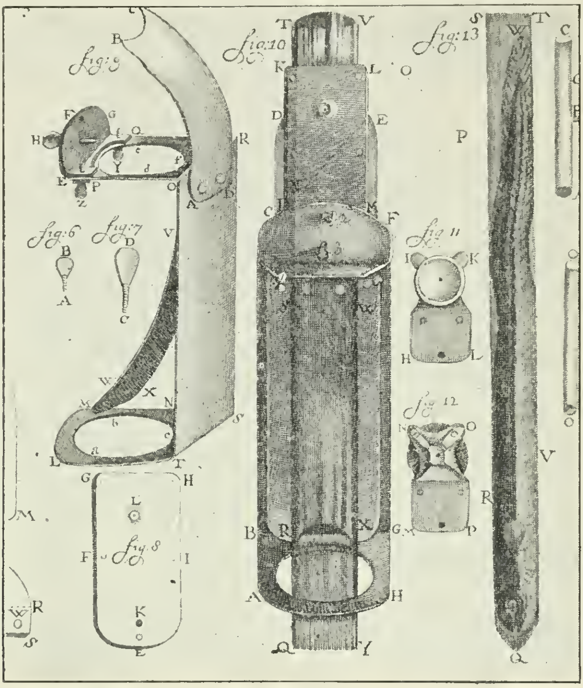

FIG. 4.

One of Leeuwenhoeck's microscopes. It consists merely of a metal plate (shown in detail in fig. 8) pierced by a small hole into which a minute lens (L) is fitted. This plate fits on a frame (shown in detail in fig. 9) into which a tube (fig. 13) containing a small live eel is placed. By adjusting screws the tail of the eel can be brought into focus, and the capillary circulation examined. The apparatus is shown fitted up in fig. 10.

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[1] Monconys, "Journal des Voyages," Par., 1677, part ii, pp. 153, 161.

[2] The figure we reproduce is from the edition of the "Ars Magna Lucis et Umbrae," Amsterdam, 1671, part iii, 9, p. 770. The instrument is described, but not figured on p. 837 of the Rome (1646) edition.

of this type was the introduction of lenses of very short focal length. As early as 1665, Robert Hooke used for the purpose small glass balls formed by fusing threads of drawn glass.[1] Later, Hooke greatly improved on these. Excellent spherical lenses were also made by Hartsoeker, who was using them about 1668. Butterfield[2] and Jan van Mussenbroeck were a little later in the field.

It was Antony van Leeuwenhoeck, however, who perfected these instruments. He brought an extraordinary skill and industry to bear on the grinding and polishing of minute lenses of short focal length. Already in 1673 Regnier de Graaf wrote to the Royal Society in London that Leeuwenhoeck was making glasses far superior to those of the great Italian lens maker, Eustachio Divini. Leeuwenhoeck's success was largely due not only to his method of grinding, but also to the skill with which he mounted his lenses, which were accurately fitted into a minute hole in a metal plate. The object to be examined was firmly held in a stand and adjusted by means of a screw movement to the plate (see description of fig. 4). By this means, and by the use of hollow metal reflectors, he succeeded in availing himself of transmitted light in the case of transparent objects. Leeuwenhoeck was able to

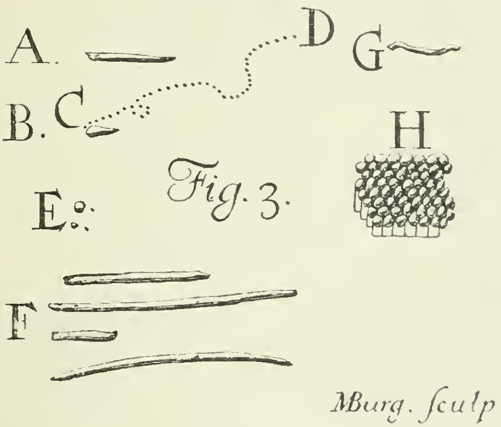

FIG. 5.

Bacteria as figured by Leeuwenhoeck (*Phil. Trans.*, 1683). At E, cocci are shown; at A, F, and G, rod-shaped organisms; at H, sarcinæ; and at C a flagellated organism.

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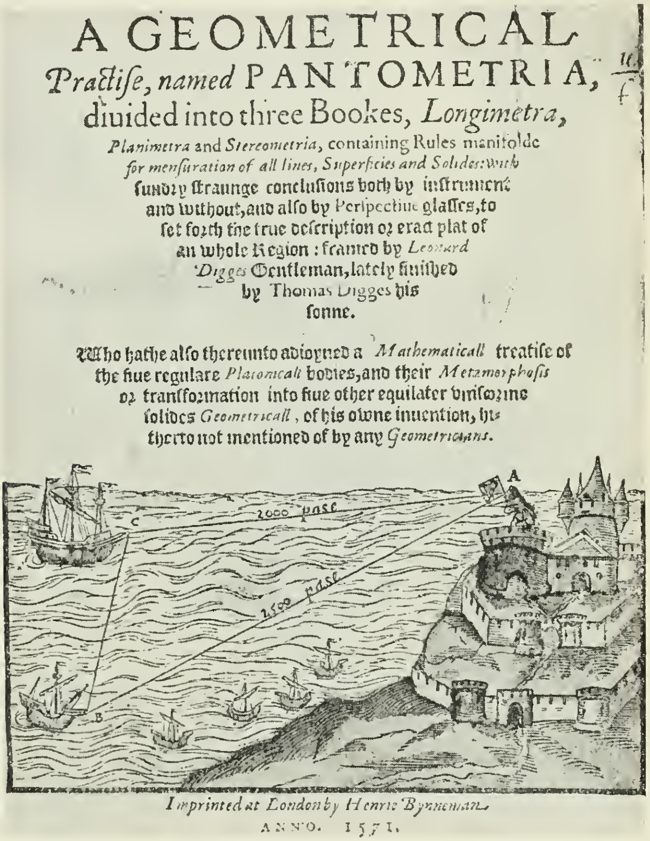
[1] Mentioned in *Phil. Trans.*, March 4, 1678, and in "Micrographia," Lond., 1665.

[2] *Phil. Trans.*, 1677, p. 226.

make immense advances with these instruments; rotifera and infusoria he could see with ease, and by 1683 he had even attained a sight of the bacteria (fig. 5). Instruments similar to these of Leeuwenhoeck seem to have been used by Malpighi, who, however, also employed the compound apparatus.



A GEOMETRICAL
Practiſe, named PANTOMETRIA,
diuided into three Bookes, *Longimetra,*
Planimetra and *Stereometria*, containing Rules manifolde
for menſuration of all lines, Superficies and Solides: With
ſundry ſtraunge concluſions both by inſtrument
and without, and alſo by Perſpectiue glaſſes, to
ſet forth the true deſcription or exact plat of
an whole Region: framed by *Leonard*
Digges Gentleman, lately finiſhed
by Thomas Digges his
ſonne.

Who hathe alſo thereunto adioyned a *Mathematicall* treatiſe of
the fiue regulare *Platonicall* bodies, and their *Metamorphoſis*
or tranſformation into fiue other equilater vniforme
ſolides *Geometricall*, of his owne inuention, hi-
therto not mentioned of by any *Geometricians.*

Imprinted at London by Henrie Bynneman.
ANNO. 1571.

FIG. 6.

Title-page of Digges's "Pantometria," 1571.

Leeuwenhoeck's researches represent the high-water mark of work done with the simple microscope. Considerable advances were made on his instruments in the following century, but their application was to a different class of object, and they are outside our present scope. After Leeuwenhoeck, most high-class microscopic work was accomplished with the compound instrument.

(II) THE COMPOUND MICROSCOPE.

The earliest history of the compound microscope is inextricably involved with that of the telescope, and must in the first instance be considered with it. Setting aside certain unverifiable claims, probably the first writer who suggested the possibility of using a system of lenses for the purpose of making a distant object apparently nearer was the English mathematician, Leonard Digges (died 1571). In a work published by his son shortly after the father's death (fig. 6) we read that "marueylouse are the conclusions that may be perfourmed by glasses concaue and conuex of circulare and parabolicall fournes, using for multiplication of beames sometime the ayde of glasses transparent, which by fraction should unite or dissipate the images or figures presented by the reflection of other. By these kinds of glasses or rather frames of them, placed in due angles, ye may not only set out the

FIG. 7.

Giambattista della Porta.

proportion of an whole region, you represent before your eye the lively image of euery towne, village, etc., and that in as little or great space or place as ye will prescribe, but also augment and dilate any parcell thereof, so that whereas at the firste apparance an whole towne shall present it selfe so small and compacte together that ye shall not discerne any difference of streates, ye may by applycation of glasses in due proportion cause any peculiare house or roume thereof dilate, and shew it selfe in as ample fourme as the whole towne first appeared, so that ye shall discerne any trifle or reade any letter lying there open, especially if the sonne beames may come unto it, as playnly as if you wer corporally present, although it be distante from you as farre as eye can discrye. But of these conclusions I minde not here more to intreate, hauing at large in a volume by it selfe opened the miraculous effectes of perspective glasses."[1] Digges's system appears to have been combined in some manner with a camera obscura. Unfortunately, his further description of it was never published.

The idea, however, was taken up by Porta (fig. 7), a writer who, although not himself original, was gifted with great curiosity and industry in the collection of the ideas of others. In the 1588 edition of Porta's "Magia Naturalis," a hotchpotch of the wonders that were then exciting the interest of mankind, we read how "to make plain a letter held far away by means of a lens of crystal." He was apparently himself myopic, for he says that "concave lenses enable one to see far off more clearly while convex ones make near objects more discernible," and he goes on to say that "with a concave lens you see things afar smaller but plainer, with a convex lens you see them larger but less distinct. *If, however, you know how to combine the two sorts properly* you will see near and far both large and clear."[2]

At some date shortly after the publication of Porta's work a practical application of the combination of two lenses into a microscope or telescope was made by the Dutchman Zacharias, miscalled Jansen[3] (fig. 8).

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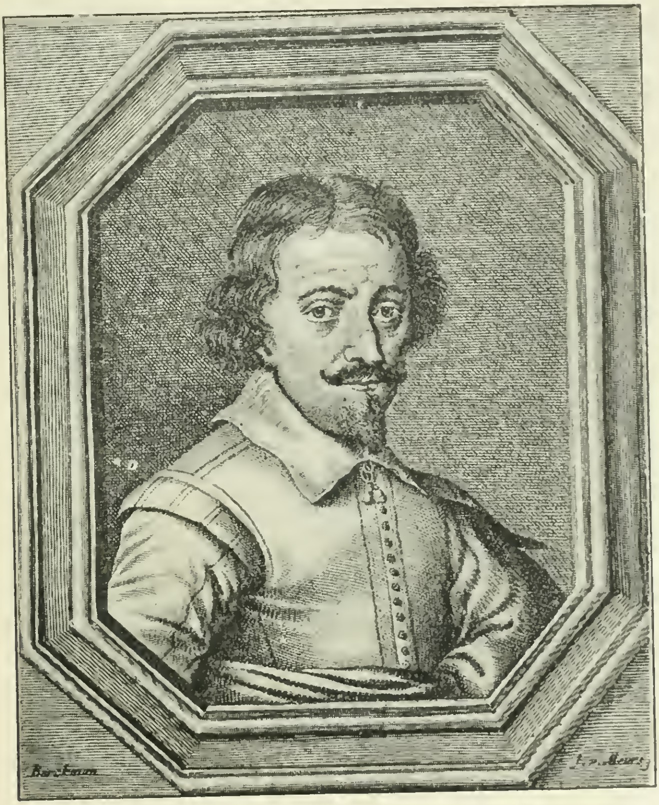
[1] "A Geometrical Practise named Pantometria . . . framed by Leonard Digges Gentleman, lately finished by Thomas Digges his sonne," Lond., 1571. Suggestions as to the nature of Digges's apparatus are made by Major-General J. Waterhouse, "Proceedings of the Optical Convention," 1905, p. 115.

[2] G. Battista della Porta "Magia Naturalis," Naples, 1588, lib. xx. There are earlier editions from 1558 onwards, which, however, do not include this passage. These earlier editions, nevertheless, show a full knowledge of the properties of convex lenses as burning glasses and magnifiers.

[3] The name Jansen is due to a misunderstanding. Zacharias was indeed the son of John, the spectacle maker, but *Jansen* was not, in this case, a surname. *See* Vincenzo Rocchi, loc. cit., p. 9.

Zacharias was born at Middelburg in Holland about 1580, and about 1590, while still a lad and at work in the shop of his father who was a spectacle maker, he appears to have discovered accidentally the principle of the telescope, by placing two lenses together in a tube.[1]



ZACHARIAS IANSEN

Fig. 8.

From Borel's "De Vero Telescopio Inventore."

The invention of the microscope followed at some unknown date. The event is thus described by Willem Boreel (1591-1668), the Dutch ambassador to France,[2] in a letter to the Frenchman, Pierre Borel:

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[1] The scanty details of the life of Zacharias are given in A. J. van der Aa's "Biographisch Woodenboek der Nederlander Negende," Haarlem, 1860.

[2] *See* Pierre Borel, "De vero telescopii inventore cum brevi omnium conspiciliorum historia," The Hague, 1655, p. 34 *ff*.

"I am a native," says Boreel, "of Middelburg, the capital of Zeeland, and close to the house where I was born . . . there lived in the year 1591 a certain spectacle maker, Hans by name. His wife, Maria, had a son Zacharias whom I knew very well, because I constantly as a neighbour and from a tender age went in and out playing with him. This Hans or Johannes with his son Zacharias, as I have often heard, were the first to invent microscopes, which they presented to Prince Maurice, the governor and supreme commander of the united Dutch forces, and were rewarded with some honorarium. Similarly they afterwards offered a microscope to the Austrian Archduke Albert, supreme governor of Holland. When I was ambassador to England in the year 1619, the Dutchman Cornelius Drebbel of Alkomar, a man familiar with many secrets of nature; who was serving there as mathematician to King James, and was well known to me, showed me that very instrument which the Archduke had presented as a gift to Drebbel, namely, the microscope of Zacharias himself. Nor was it (as they are

Fig. 9.

Instrument discovered by Harting at Middelburg in 1866, and assigned to the earlier part of the seventeenth century. It is perhaps the oldest compound microscope now in existence and has been erroneously attributed to Zacharias. (Reproduction by kind permission of Sir Frank Crisp.)

now seen) with a short tube, but nearly two and a half feet long, and the tube was of gilded brass two fingers' breadth in diameter, and supported on three dolphins formed also of brass. At its base was an ebony disc, containing shreds or some minute objects which we inspected from above, and their forms were so magnified as to seem almost miraculous."[1]

This report is supported in almost every detail by evidence collected by Pierre Borel from the town councillors of Middelburg. The microscope is no longer in existence, but we are able to show pictures of instruments no less vast and clumsy which were in use as late as 1656 by C. Schott[2] (fig. 10).

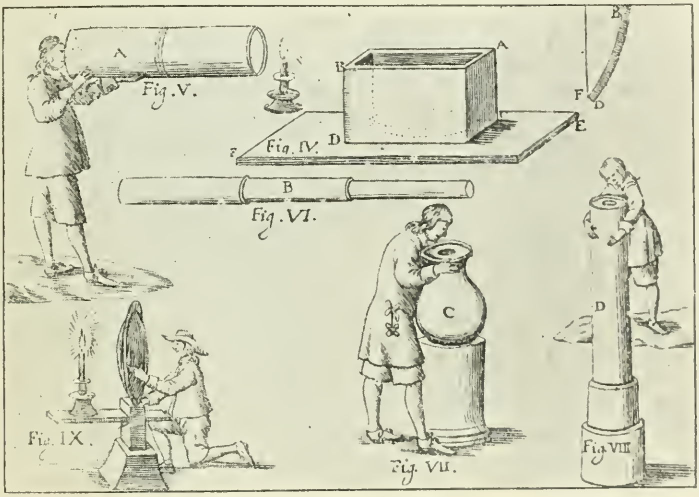

FIG. 10.

Microscopes from C. Schott's "Magia universalis," 1656.

There seems no reason to doubt the very circumstantial account given by William Boreel, and the honour of having constructed the first bilenticular instrument, albeit perhaps accidentally, rests with Zacharias, who was closely followed by another Dutch lens maker,

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[1] P. Borel, "De vero inventore," p. 29 *ff.*

[2] C. Schott, "Magia universalis," 1656. In the opinion of Sir Frank Crisp, however, the apparent size of these microscopes was due to an error of the engraver, who placed an entire figure where the draughtsman had only placed an eye.

Joannes Laprei or Lipperhey, of Wesel. The real work, however, of introducing it to the notice of the scientific world lay with Galileo, whose own account of the matter we now give from the "Sidereus Nuncius," published at Venice in 1610: "About ten months ago," he says, "a rumour reached me of an ocular instrument made by a certain Dutchman by means of which an object could be made to appear distinct and near to an eye that looked through it, although it was really far away. . . . And so I considered the desirability of investigating the method, and I reflected on the means by which I might come to the invention of a similar instrument. A little later, making use of the doctrine of refractions, I first prepared a leaden tube at the ends of which were placed two lenses each of them flat on one side, and as to the other side I fashioned one concave and the other convex. Then moving the eye to the concave one, I saw the objects fairly large and nearer, for they appeared three times nearer and nine times larger than when they were observed by the naked eye. Soon after I made another more exactly, representing objects more than sixty times larger. At length, sparing no labour and no expense, I got to the point that I could construct an excellent instrument so that things seen through it appeared almost a thousand times greater and more than thirty-fold nearer than if observed by the naked eye."

Galileo had many detractors, and in answering one of them he places his relationship to the unnamed Dutchman (who was doubtless Zacharias the spectacle maker) in its true light. "Some," he says, "would tell me that it is of no little help in the discovery and resolution of a problem to be first of all in some way aware of the true conclusion and certain of not being in search of the impossible, and that therefore the knowledge and the certainty that the microscope had indeed been invented had been of such help to me that perchance without that I should not have discovered it. To this I reply that the help rendered me by the knowledge did indeed stimulate me to apply myself to the notion, and it may be that without this I should never have thought of it. Beyond this I do not believe that knowledge to have facilitated the invention. But after all the solution of a problem, thought out and defined, is a work of some skill and we are not certain that the Dutchman, the first inventor of the telescope, was not a simple maker of ordinary lenses who, casually arranging glasses of various sorts, happened to look through the combination of a convex and a concave one placed at various distances from the eye and in this way observed the effect that followed thereon. But I, moved by the knowledge given, discovered it by a process of reasoning."[1]

Galileo's "Sidereus Nuncius" contains also the first rough figure of the path of the rays of light in a bilenticular system, the theory of which was more clearly expressed by Johannes Kepler in the year 1611.[2] Although, however, so large and important a share in the invention of the compound microscope and telescope rests with Galileo

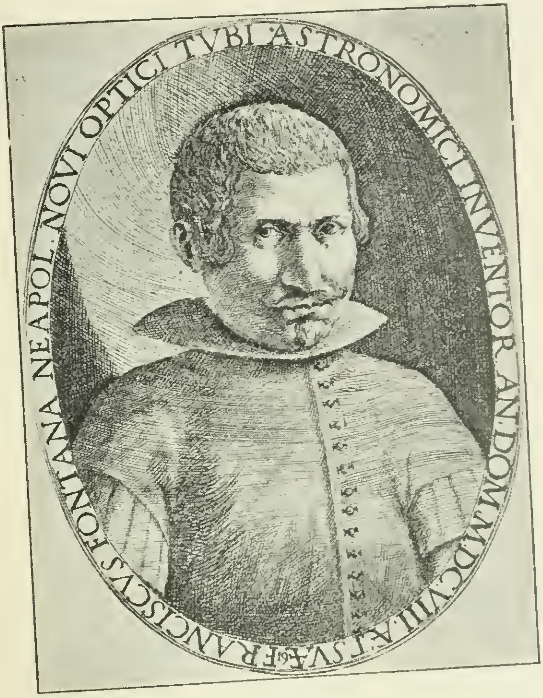
FRANCISCVS FONTANA NEAPOL. NOVI OPTICI TVBI ASTRONOMICI INVENTOR AN. DOM. MDCVIII. AET. SVAE

Fig. 11.

Francisco Fontana, the astronomer, from his "Novae Cœlestium Terrestriumque Observationes," 1646.

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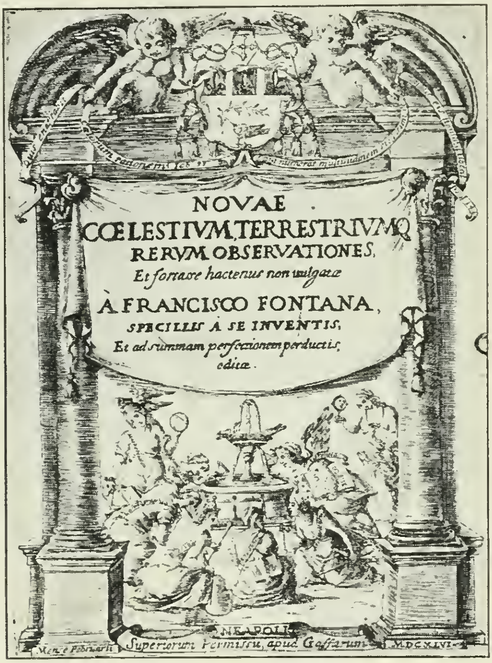
[1] Galileo Galilei, "Il Saggiatore nel quale conbilancia esquisita e guista si ponderano le cose contenute nella Libra astronomica e filosofica di Lotaris Sarsi Sigensans," Rome, 1623, p. 62.

[2] J. Kepler, "Dioptrice, seu Demonstratio eorum quae visui et visibilibus propter conspicilla non ita pridem inventa accidunt. Praemissa Epistolae Galilaei de iis quae post editionem Nuncii siderii ope Perspicilli, nova et admiranda in coelo deprehensa sunt. Cologne 1511." See especially problemata 86 and 87.]

and Kepler, yet the theory of the instrument, even apart from chromatic aberration, could not have been on a satisfactory basis until the work of Wilibrod Snell van Royen (1581-1626) on the reflection and refraction of light, and his enunciation of the "sine law" about 1620.

Perhaps one of the earliest practical users of the compound microscope was the astronomer Francisco Fontana, of Naples (fig. 11). In 1646 was first published his "New Observations of the Things of Heaven and of Earth"[1] (fig. 12). This work is chiefly valued for an admirable illustrated account of the transit of Venus, as well as of Saturn's rings, Jupiter's belts and the surface of the moon as investigated by means of his telescope. The book is divided into eight tractates, of which the first seven are astronomical. The eighth tractate is entitled



NOVAE
CŒLESTIVM, TERRESTRIVMQ
RERVM OBSERVATIONES,
Et fortasse hactenus non vulgatæ
À FRANCISCO FONTANA,
SPECILLIS À SE INVENTIS,
Et ad summam perfectionem perductis,
editæ.

NEAPOLI
Mense Februarii *Superiorum Permissu, apud Gaffarum* MDCXLVI.

FIG. 12.

Title-page of Fontana's work containing microscopical observations, 1646.

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[1] "Novae Caelestium terrestriumque rerum observationes et fortasse hactenus non vulgatae a Francisco Fontana specillis a se inventis et ad summam perfectionem productis editae," Naples, 1646.

"Of the Microscope, by means of which the most minute and quasi-invisible things are so enlarged that they may be clearly and distinctly seen." He here claims to have invented the compound instrument as early as 1618, and produces evidence that he was already using it in 1625.

That the microscope was fairly well known in Italy about this time may be gathered from a passage in a most curious and beautifully illustrated work on the then newly discovered sun spots, produced by Christopher Scheiner between 1626 and 1630 and entitled "Rosa Ursina."[1] Scheiner describes how "if two convex smoked lenses are fixed correctly in a tube, they make an admirable helioscope," and goes on to say that "in the same fashion is constructed that wonderful

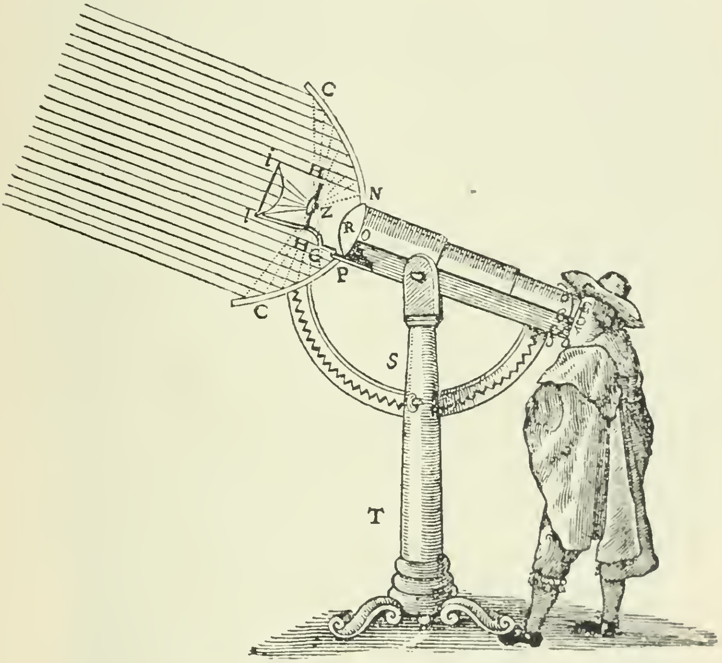

FIG. 13.

Descartes's microscope. From his "Dioptrique," 1637.

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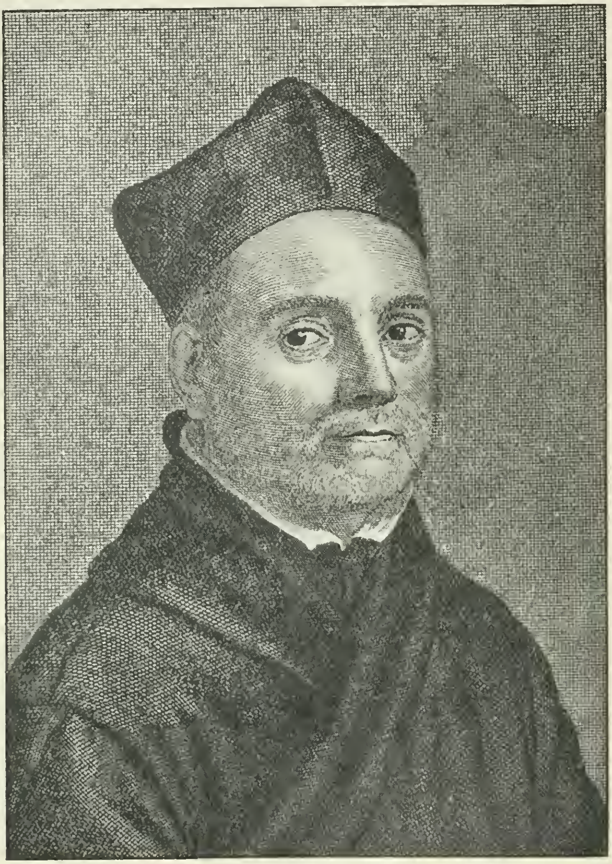
[1] Christopher Scheiner, "Rosa Ursina sive sol ex admirando facularum et macularum suarum Phaenomeno varius. Bracciani Impresso coepta Anno 1626 finita vero 1630, Id. Junii." Quotation from lib. ii, cap. xxx, p. 130, l. 33.

instrument the microscope, by means of which a fly is magnified into an elephant, and a flea into a camel, and other things are rendered apparent which escape the acuteness of the human eye by reason of their extreme smallness."



P. ATHANASIVS KIRCHERVS FVLDENSIS
ê *Societ:* Ieſu Anno ætatis LIII.
Honoris et observantiæ ergo sculpsit et D.D. C. Bloemaert Romæ 2 Maij A. 1655

FIG. 14.

A curious and aberrant form of compound microscope was described in 1637 by the philosopher Descartes, in his "Dioptrique."[1] This instrument, which was really an adapted telescope, consisted of an adjustable tube carrying two lenses (fig. 13). The ocular was plano-concave, while the double convex objective was mounted in the centre of a concave mirror adapted to concentrate parallel rays on to the object. Rays were also concentrated on the object by means of a second plano-convex lens placed in the direct line of light after the manner of a modern substage condenser. The device is a clumsy one and never seems to have attained popularity, though the custom of fixing the objective in the centre of a concave reflecting surface was temporarily revived in the eighteenth century.

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[1] "René Descartes, La Dioptrique," ninth discourse. The "Dioptrique" was published as an appendix to the "Discours de la Méthode," Leyden, 1637.

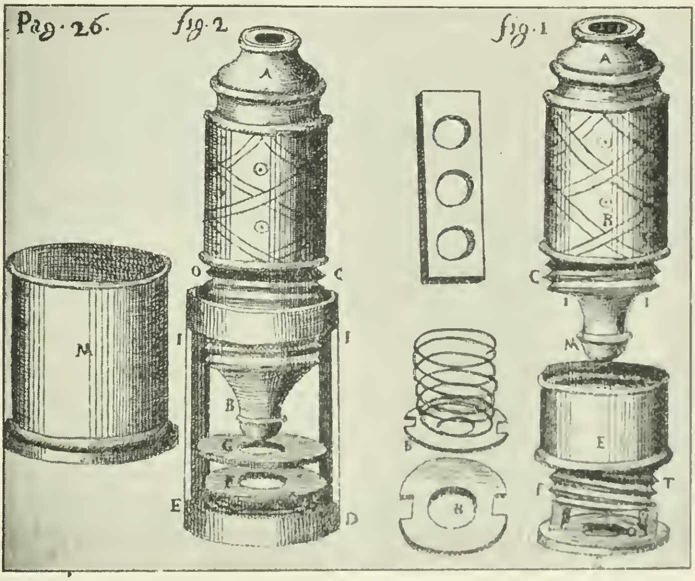

Fig. 15.

Kircher's compound microscope. (From Zahn.)

A practical microscopist of early date with some knowledge of optical principles was Athanasius Kircher (fig. 14), whose observations we shall presently discuss. Kircher's first microscopical work appears to have been done with a simple instrument given to him by Cardinal Giovanni Carlo, son of Cosimo Medici II[1] (fig. 2). But he must have understood clearly enough the principles of the compound instrument from the works of Fontana and Scheiner, both of whom he quotes. For the "experiments" which he details in a later volume, the famous "Scrutinium Pestis" of 1658, he apparently used the compound microscope which was figured after his death by Buonanni and others (fig. 15). This microscope consisted of a rigid tube, with a lens at each end. The focus was obtained by screwing the tube up and down in a vertical stand. Later an increased refinement was secured with a second adjustment and the illumination was improved by a substage condenser, the instrument being used in a horizontal position[1] (fig. 16). Malpighi saw the circulation of the blood on the surface of the frog's lung by means of a compound microscope and Hooke had constructed a serviceable and elegant compound apparatus with an objective of very short focal length before the publication of his "Micrographia" in the year 1665 (fig. 17). He figures the instrument as provided with a condensing apparatus for concentrating either the sun's rays or those

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[1] Athanasius Kircher, "Ars Magna Lucis et Umbrae." Rome, 1646, p. 835.

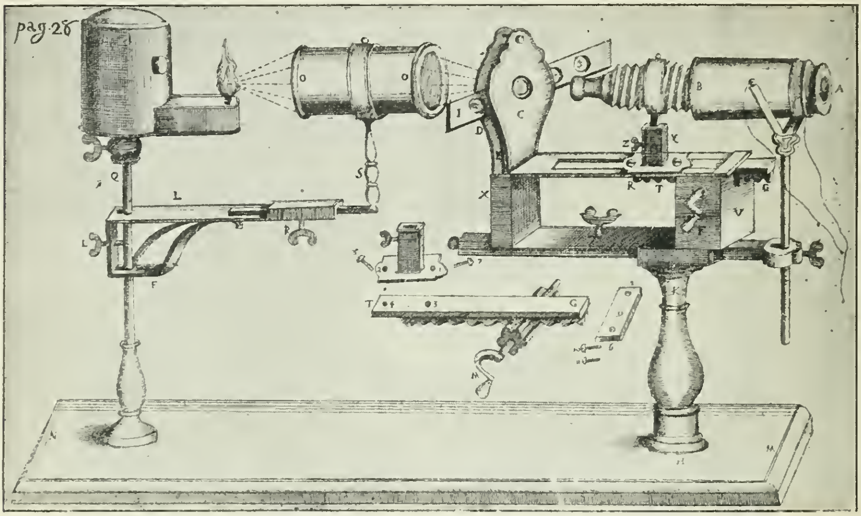

Fig. 16.

Kircher's compound microscope adapted with coarse and fine adjustment and substage condenser. (From Zahn.)

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[1] Philippo Buonanni, "Museum Kircherianum," Rome, 1709.

of an attached lamp. Microscopes similar to those of Kircher and of Hooke may still be seen in a state of good preservation in the Galileo Museum at Florence. Kircher's own instruments, however, have completely disappeared from the Museo Kircheriano at Rome.

Nehemiah Grew, in the Catalogue of the Museum of the Royal Society in 1681, describes among the objects there deposited a simple microscope as well as "A large Microscope with three Glasses, and several Screws to fit it for all manner of positions. It magnifies the Area of the object to above a hundred times the extent thereof to the bare Eye." He distinguishes between the uses of the two types of microscope and tells us that "the advantage of one with more Glasses, is that it takes in a bigger object, or a greater part of it. Of one single Glass, that it shews the Object clearer. So that to have a distinct representation of it, 'tis convenient to make use of both." He goes on to tell us that "of the latter kind, I have seen several made by

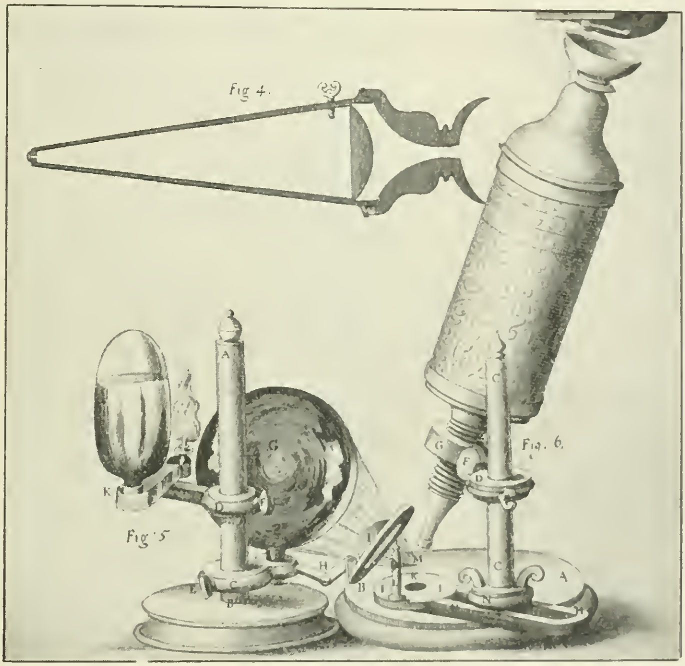

FIG. 17.

Hooke's microscope. (From "Micrographia," 1665.)

Mr. John Malling in this City (London), not only with melted, but with Ground-Glasses so very small, that one of these Ground-Glasses being weighed in the Assay-Scales in the Tower, was found not above the fourscorth part of a Grain. The Diametre or Chord $\frac{1}{25}$th part of an inch. Another so small, that those scales were not nice enough to weigh it. The Chord hereof to that of the former is as two to three. These are the clearest and best that ever I saw."

The early microscopist who seems to have best grasped the principles and possibilities of the compound microscope and who realized the effect of a number of combined lenses was Eustachio Divini, who in 1663 was using a combination of six lenses[1] (fig. 18), while Johannes Zahn, in 1685,[2] illustrates well the path of the light rays in an instrument composed of four lenses. After that date the compound instrument rose steadily in favour, and after Newton had shown the theoretical possibility of an achromatic instrument, many improvements were slowly introduced. The simple lens thus ceased to be a competitor of the compound microscope, though it retained, as it always will, the value assigned to it by Grew, in its own line of investigation.

(III) SOME PIONEERS OF MICROSCOPICAL OBSERVATION.

Sir Theodore de Mayerne, in his preface to Mouffet's "Insectorum Theatrum"[3] (written about 1590 and published 1634), tells us how he was accustomed to observe small insects with a magnifying glass. "If you will take," says Mayerne, "lenticular optick glasses of Crystal (for though you have Lynx his eyes, they are necessary in searching for Atoms) . . . you will admire to see . . . the Fleas that are curasheers, and their . . . hollow trunk to torture men, which is a bitter plague to maids, . . . you shall see the eyes of the Lice sticking forth, and their horns, their bodies crannied all over, their whole substance diaphanous, and, through that, the motion of their heart and blood as if it floted in *Euripus* . . . Also little Handworms, which are indivisible, they are so small, being with a needle prickt forth from their trenches near the pool of water which they have made in the skin, and being laid upon one's nail, will discover by the sunlight their red heads and feet they creep withal." Mouffet himself refers to these acari as "the smallest of living creatures." He compares them to the mites of cheese, and correctly distinguishes them from the Pediculi. It is still doubtful how long before Mayerne the itch mite was investigated by means of magnifying glasses.

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[1] Eustachio Divini, "Lettera all Ill^{mo} Sig. Conte Carl, Antonio Manzini. Si raggaglia di un nuovo lavoro e componimento di Lenti, che servono à Occhialoni ò semplici, ò composti," Rome, 1663.

[2] Joannes Zahn, "Oculus artificiales, Teledioptricus, sive Telescopium," Herbipoli, 1685, p. 174.

[3] Thomas Mouffet, "Insectorum sive Minimorum Animalium Theatrum." The original MS., written about 1590, is now in the British Museum (Sloane MS., 4014, with engraved portrait). It fell into the hands of Mayerne and was published by him in 1634. A charmingly translated English version of the work and of Mayerne's preface, from which the above quotation is made, appeared from the hand of J(ohn) R(owland) in 1658 as "The Theatre of Insects or lesser living creatures."

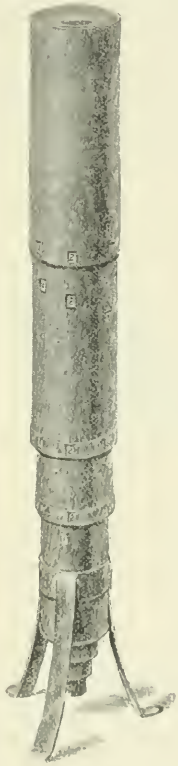

FIG. 18.

Microscope believed to be that of Eustachio Divini (1667). The body was constructed of cardboard and was provided with three draw tubes. This instrument was described as being in the Museo Copernicano at Rome by the late Mr. Mayall, in 1886. (Reproduction by kind permission of Sir Frank Crisp.)

The earliest illustrated publication for which there is any evidence that a magnifying glass was used is by Hoefnagel and appeared at Frankfort in 1592.[1] The work consists merely of a series of copper plates of objects of natural history, but they are engraved with extraordinary beauty and accuracy, and some of them are enlarged in greater detail than would appear possible with the unaided eye. These remarkable figures are stated to have been drawn by a youth, aged 17. We reproduce here his magnified figure of the domestic fly (fig. 19).

In the first third of the seventeenth century, and before the period of true microscopic discovery, considerable attention was paid to the minute structure of natural objects, curiosity being aroused by attempts to discover with the magnifying glass the "atoms" comprising the minute structure of matter. One of the very earliest scientific workers with the microscope, inspired by such influences, was the noble and unfortunate Federigo Cesi, Duke of Aquasparta (1590-1629), the companion of Galileo and the president and founder of the Academia dei Lincei. Cesi was already using the instrument with effect before 1628. His microscopic skill is attested by his contemporary and associate, Johannes Faber (1578-1640), whose remarks on the subject drew the attention of our own Sir Thomas Browne (1604-82). In an interesting passage published in 1646,[2] showing larger powers of

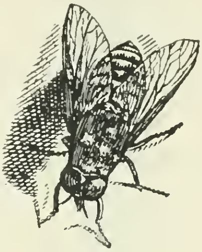

FIG. 19.

Enlarged figure of fly, as drawn by Hoefnagel, 1592.

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[1] The title page is worded as follows: "Archetypa studiaque patris Georgii Hoefnagelii. Jacobus F. genio duce ab ipso scalpta, omnibus philomusis amicé D: ac perbenigné communicat. Ann: sal: XCII. Aetat: XVII. Frankfort a/M."

[2] Sir Thomas Browne, "Pseudodoxia Epidemica, or Enquiries into very many received Tenents and commonly presumed Truths," Lond., 1646, Book II, chap. vii, 3.

scientific judgment than is perhaps usually placed to the credit of the great stylist, Browne writes as follows concerning the sporangia of ferns: "Whether those little dusty particles, upon the lower side of the leaves be seeds and seminal parts . . . we have not yet been able to determine by any germination . . . from them when they have been sown on purpose . . . But by the help of Magnifying Glasses, we find these dusty Atoms to be round at first and fully representing seeds, out of which at last proceed little mites, almost invisible; so that such as are old stand open, as being emptied of some bodies formerly included, which though discernible in Hartstongue, is more notoriously discoverable in some differences of Brake or Fern. *But exquisite Microscopes and Magnifying Glasses have at last cleared this doubt, whereby long ago the noble Fredericus Caesius beheld the dust of Polypodi as bigg as Pepper corns;* and as Johannes Faber testifieth, made draughts on paper of such kind of seeds, as big as his Glasses represented them, and set them down as such plants under the Classis of Herbae Tergifoetae, as may be observed in his notable Botanical Fables."[1] Fragments of Cesi's herbarium still exist in Rome, but I have searched these without finding the figures to which Faber and Browne refer.

One of the best and most accurate early pieces of microscopic research was published in 1644 at Palermo by the Sicilian Hodierna.[2] This acute observer applied himself to the investigation of the eyes of insects, and his description of the eye of the fly is surprisingly fresh and good (fig. 20). "AB represents the entire head of the animal cut off from the rest of the body. It may here be seen that the head is all eyes, prominent and without lids, lashes or brows. It is plumed with hairs like that of an ostrich and has two little pear-shaped bodies hanging from the middle of the forehead. The proboscis which arises from the snout can be extended freely and stretched forth to suck up humours and can afterwards be directed back through the mouth to be taken into the gullet. This instrument nature has given the creature according to its need, for it is without a neck and cannot stretch forth its head to obtain its food, as is also the case with the elephant. C represents the whole eye cut off from the head AB on which can be seen more than thirty thousand little figures (quadretti) imprinted on the surface of the red cornea. D represents half an eye cut from the surface to the centre, so that the disposition of the crystalline structures can be seen. The crystalline structures, with their bases on the surface of the cornea, pass in a pyramidal fashion to end on the little tunic of the Uvea. This occupies the centre of the eye and in its interior the cerebral substance is enclosed. E is a white mulberry fruit which resembles the fly's eye in its similar disposition of facets as does also the strawberry represented at F."

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[1] This passage is a paraphrase of one of Johannes Faber (1587-1640), physician to Urban VIII. Faber produced at Rome, in 1628, a work entitled "Animalia Mexicana." Browne's quotation is taken from page 757 of Faber's work, which was, in fact, actually printed before that of Cesi. Cesi's "Phytosophicarum Tabularum ex Frontispiciis Naturis Theatri," was completed in 1628, but was not published until 1630, after the author's death. It has been partially reprinted by Pirotta (Rome, 1904). I have been unable to trace the passage in Pirotta's reprint or in the editions of 1649 or 1651. The original edition of 1630 I have not seen.

[2] Giambattista Hodierna, "L'occhio della mosca discorso fisico intorno all'anatomia dell'occhio in tutti gl'animali anulosi, detti insetti," Palermo, 1644.

One of the very first to collect observations made by the aid of the compound microscope was Francisco Fontana, whom we have already considered among the pioneer constructors of the instrument. His tractate on the microscope (1646) contains a terminal chapter of four pages in which is briefly set forth a small series of observations on the mites in cheese, on the structure of the flea, the ant and the fly, and on other subjects, including the human body. We give here an example of his observations: "On the creatures that arise in powdery cheese." "The powder examined by means of this instrument does not present the aspect of dust, but teems with animalcula . . . It can be seen that these creatures have claws and talons and are furnished with eyes. The whole surface of their body is beautifully and distinctly coloured in such sort as I have never before seen, and which indeed, cannot be seen without wonder. They may be observed to crawl, eat and move and are equal in apparent size to a man's nail. Moreover, their backs are

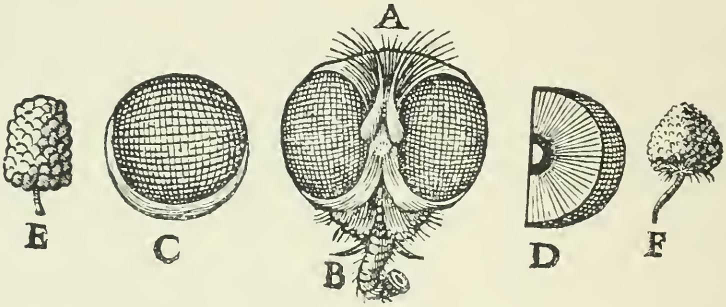

Fig. 20.
The fly's eye, after Hodierna, 1644.

all spiny and pricked out with various star-like markings and surrounded by a rampart of hairs, all of such a marvellous kind that you would say they are a work of art rather than of nature."

Probably, the first practical physician who used a microscope in the course of his profession was Pierre Borel (1620-71). This versatile and gifted man, the son of a mathematician, struggled through youthful poverty and adversity to a very prominent position in the intellectual life of France.[1] Borel himself acquired considerable grasp of mathematical principles and was an ardent follower of Descartes. He was certainly in possession of a microscope and understood its uses before 1649.[2] His "Historiarum et Observationum Medico-Physicarum" of 1653 is, we believe, the first medical work involving the use of the microscope,[3] and the following quotation from it suggests that he had already, at that early date, obtained a view of the blood corpuscles.

"On Whale-shaped Insects in Human Blood (Century III, Observation 4).—Animals of the shape of whales or dolphins swim in the human blood as in a red ocean. . . . These creatures, it may be supposed (since they themselves lack feet) were formed for the bodily use of the more perfect animals within which they are themselves contained, and that they should consume the depraved elements of the blood.[4] If you would like to see these, take a sheep or ox liver, cut it into small portions and place it in water, teasing and separating it with your hands, and you will see many such animals escaping from them, nor will they be destitute of movement if the liver is fresh. They lurk in the large veins, and I think that they are those worms which are found in the stomach, being transformed when they change their position."

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[1] A short account of the life of Borel is prefixed to "Les Antiquites de Castres," Paris, 1868, a reprint by C. Pradel of a work by Borel, published in 1649 (see following note).

[2] In a small volume entitled "Les Antiquités, Raretés, Plantes, Minéraux et autres choses considérables de la Ville, and Comté de Castres d'Albigeois," Castres, 1649, is an appendix consisting of a catalogue of Borel's museum. Among the objects mentioned are mirrors concave and convex, burning glasses, and also "De lunettes à la puce, ou *microscopes* qui grossissent fort les objets. De lunettes de multiplication, et pour approcher les objets," p. 147. Hoefer's "Nouvelle Biographie universelle" refers to an earlier edition of this catalogue, dated 1645 (when Borel was only 25), which we have not seen.

[3] Pierre Borel, "Historiarum et Observationum Medico-physicarum Centuria, prima [et secunda]," Castres, 1653. Our authority for the existence of this edition, which we have not seen, is Hoefer's "Nouvelle Biographie Universelle." We have ourselves used and quoted the Paris edition of 1656. There were several subsequent editions.

[4] The language of Borel is not very clear, and it is possible that he had been examining small clots rather than blood corpuscles. We incline, however, to the latter view.

Again in a later observation[1] he gives us a glimpse of tissue structure. "The heart, kidneys, testicles, liver, lungs, and other parenchymatous organs," he says, "you will find to be full of little structures (organula) and they are like sieves by means of which Nature arranges the various substances according to the shape of the holes. Passage is thus given only to atoms of a certain shape." And lastly he prophesies the medical application of his instrument. "These microscopes," he writes, "may be used in new matters in the observation of the sick, e.g. to observe change of colour or the generation of insects."[2]

In 1655 Borel issued a work on the telescope with which is bound up a series of one hundred microscopic observations, mainly on minute insects, with a few crude illustrations.[3] The separate issue of these microscopic observations a few months later constitutes the first book devoted to microscopy.

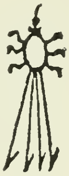


Fig. 21.

Acarus scabiei, as pictured by August Hauptmann, 1657.

We should briefly mention here August Hauptmann, a credulous writer, whose ingenuity was accustomed to outrun his judgment. To him belongs, however, the credit of being the first to figure a separate microscopic or rather submicroscopic organism[4] — viz., the *Acarus scabiei*. We give from a work of 1657 his representation of the animal, which the reader would probably not recognize without its context (fig. 21).

In many ways the most striking of these early microscopic workers is Athanasius Kircher. Impeded rather than helped by a vast learning, and befogged by a method of writing from which the reader needs to excavate the meaning, he is yet an author who exercised wide influence on his contemporaries. Kircher was born in 1601 near Fulda, and was educated at the school of the Jesuit fathers in that town. He was received into the Order of Jesus at the Archi-episcopal city of Mainz, and later became Professor at the neighbouring University of Würzburg, which had been refounded some forty years previously. In the early seventeenth century Würzburg was the stronghold of the Jesuits in Germany, and its University was largely frequented by Catholic students. In 1631, during the Thirty Years' War, so disastrous to German academic life, Gustavus Adolphus, championing the Protestant cause, occupied Würzburg. The University became disorganized and Kircher fled to Avignon, whence four years later he proceeded to Rome under the protection of Cardinal Barberini, whose brother, Urban VIII, then occupied the Papal throne. This pontiff, who will go down to posterity for the share he took in the condemnation of Galileo, had in 1627 established in Rome the celebrated "College of the Propaganda" for the education of missionaries, and to this institution Kircher became attached for eight years as professor of mathematics. Resigning in 1643, he spent the remainder of his long life in the study of archæological and scientific subjects under the protection of members of the wealthy families of the Barberini and the Medici. Through his relationship with the College of the Propaganda as well as with the priests of his own Order, Kircher was placed in an especially favourable position to obtain from all parts of the world material and information on the subjects of his study. The valuable collection that he was thus able to gather he bequeathed to the College on his death in 1680.[1] This collection has been several times described and figured.

---

[1] "Observationum Microscopicarum Centuria," The Hague, 1656, Obs. 76.

[2] "Observationum Microscopicarum Centuria," Obs. 83.

[3] Pierre Borel, "De vero Telescopii Inventore cum brevi omnium conspicilliorum historia . . . Accessit etiam Centuria Observationum Microscopicarum," The Hague, 1655. The separate title-page of the microscopic observations bears the date 1656.

[4] August Hauptmann, "Warmer Bad und Wasser Schaltz," Frankfort, 1657.

The successive appearance of Kircher's works was awaited with eager interest by the learned and curious throughout the world. Few men can have spent so busy a life as the old Jesuit. The actual physical labour of writing the endless series of works to which his name is attached might well appal a strenuous modern journalist; treatises on magnetism, a design for a calculating machine, works on optics, a history or account of the plague, monographs on philology and acoustics, theological tracts, an attempt at a universal script, a vast tome on volcanoes, mathematical works, an essay on the philosopher's stone, an attempt at a Coptic grammar, a work on Egyptian antiquities and hieroglyphics, and an account of China flowed from his pen in rapid succession. In most of his works Kircher is quite uncritical and lacking in judgment, though he displays some originality, combined with a remarkable power of absorbing both information and misinformation. In his work on the Plague,[1] however, he shows genuine insight, and gains a clear though distorted view of organisms of minute size acting

---

[1] It formed the nucleus of the Museo Kircheriano, now absorbed into the Museo Nazionale at Rome. His microscopes have apparently been lost, although some of his astronomical instruments are still preserved at the Collegio Romano.

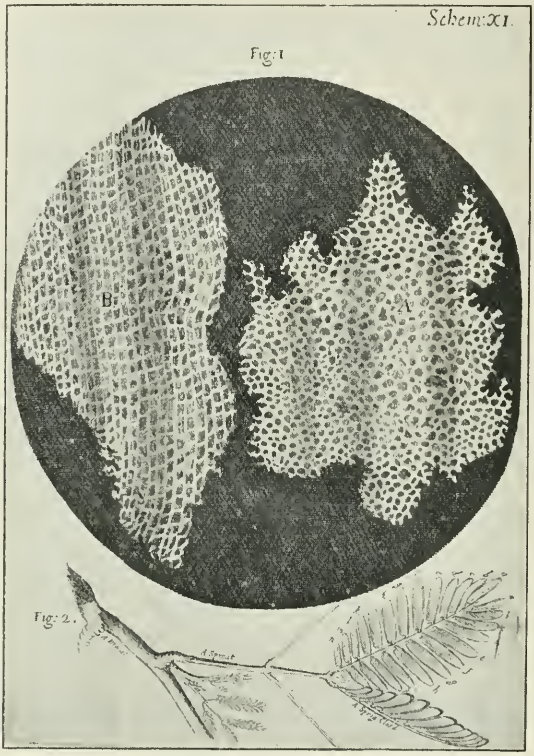


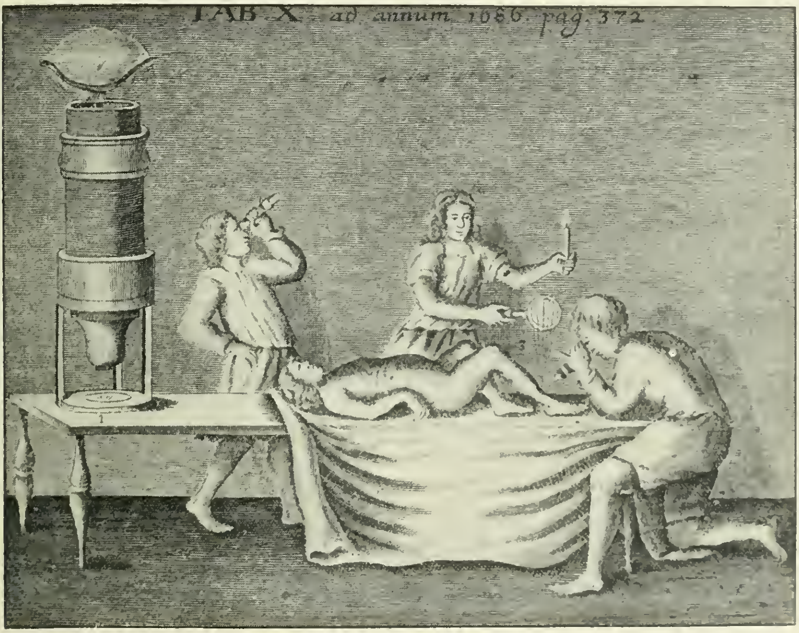
FIG. 22.

Plant cells. (From Hooke's "Micrographia," 1665.) This is probably the earliest work in which cells are figured.

---

[1] "Scrutinium Physico-Medicum contagiosae Luis, quae Pestis dictitur quo origo, causae, signa, prognostica Pestis, nec non involentes malignantis Naturae effectus, qui statis temporibus, caelestium influxuum, virtute et efficacea, tum in elementis; tum in epidemiis hominum animantiumque morbis elucescunt, una cum appropriatis remediorum Antidotis nova doctrina in lucem eruuntur," dedicated to Pope Alexander VII, Rome, 1658.

as the vehicles of contagion. Being himself a practical microscopist, he was aware of the difficulties and possibilities of the method. Thus, although his work is characterized by total disregard of "control" observations, and is undeniably marred by his credulity, he yet shows a first-hand acquaintance with minute life, which proves that he had industriously explored the microscopic world within the scope of his own rough instruments. How he managed with his endless pre-occupations to find time for such studies is a lasting mystery, but there seems to me to be no reasonable doubt that he did habitually examine forms beyond the range of unaided vision, including infusoria The organisms which he describes as occurring in the blood of the


TAB X. ad annum 1686. pag. 372

Novum Microſcopium Dn: Iosephi Campani ejusque uſus.

Fig. 23.

The earliest figure illustrating the use of the microscope in medicine, from the "Acta Eruditorum," of 1686. To the right is seen a figure examining an ulcer with the microscope while the light of a candle is focused by means of a lens in the hand of the female figure. To the left of this group another method of using the instrument is illustrated, and to the extreme left is an enlarged detail of the microscope fixed in a stand.

plague-stricken were, however, not bacteria, but either pus corpuscles or rouleaux of blood cells.

It is impossible here to discuss in detail the complicated question of Kircher's conception of the nature of infection, or the sources from which this conception was derived.[1] It will suffice to say, briefly, that he regards the essence of the disease as a "putridity of the humours," and putridity he regards as a condition produced from "semina" thrown off according to the then prevalent doctrine of "effluvia" from other putrid bodies. "Air, water and earth," he tells us, "teem with innumerable insects capable of ocular demonstration. Everyone knows that decomposing bodies breed worms, but only since the wonderful discovery of the microscope has it been known that every putrid body swarms with innumerable vermicules, a statement which I should not have believed had I not tested its truth by experiments during many years." There follows an account of a series of experiments, from which we have selected the following:—

"Experiment I: Take a piece of meat which you leave exposed by night until the following dawn to the lunar moisture. Then examine it carefully with the smicroscope and you will find the contracted putridity to have been altered by the moon into innumerable wormlets of diverse size, which, however, would escape the sharpness of vision without a good smicroscope. . . . The same is true of cheese, milk, vinegar and similar bodies of a putrefiable nature. The smicroscope, however, must be no ordinary one but constructed with no less skill than diligence, as is mine which represents objects a thousand times greater than their true size.

"Experiment II: If you cut up a snake into small parts and macerate it with rain water, and then expose it for several days to the sun and again bury it under the earth for a whole day and night, and lastly examine the parts, separated and softened by putridity, by means of a smicroscope, you will find the whole mass swarm with innumerable little multiplying serpents so that even the sharpest eyes cannot count them.

"Experiment III: Many authors claim that unwashed sage is injurious . . . but I have discovered the cause of this. For when, by means of the smicroscope, I minutely examined the nature of this plant, I found the back of the leaves entirely covered by raised work, as with the figure of a spider's web, and within the web appeared infinitesimal animalcules, which moving constantly came out of little buds or eggs. . . .

---

[1] The subject is discussed in an essay by the present writer on "The Doctrine of Contagium Vivum," in the *Proceedings of the Seventeenth International Medical Congress*, 1913 (Historical Section).

"Experiment IV: If you examine a particle of rotten wood under the smicroscope, you will see an immense progeny of tiny worms, some with horns, some with wings, others with many feet. They have little black dots of eyes. . . What must their little livers and stomachs, their tendons and nerves be like?"

With Athanasius Kircher we leave the actual pioneer period of microscopy and enter on what may be called the classical epoch of our subject. This field has been well covered by historical writers, and the literature is more accessible. Here, therefore, we may part with the reader in the goodly company of Robert Hooke, Nehemiah Grew, Anthony Leeuwenhoeck, Jan Swammerdam and Marcello Malpighi.

Mr. D'Arcy Power referred to the interest of Dr. Singer's paper, and said that in 1912 he showed a portrait of Dr. William Harvey, dated 1639. The background of the picture contained a microscope which was identical in form with Descartes's microscope (fig. 13). It seemed clear, therefore, that the microscope described by Descartes in 1637 was used by Harvey two years afterwards.

Suggested Scheme for the Restoration of the Tomb of Avicenna.

By Sir William Osler, Bt., M.D., F.R.S.

Sir William Osler called attention to the need for restoring the tomb of Avicenna. He stated that the sarcophagus still exists and that from time to time the tomb itself had been repaired. The present cost of repair and the expense of keeping a watchman would be from £500 to £600, a sum which might perhaps be raised without much difficulty by the combined action of the Société Française d'Histoire de Médécine with the Royal Society of Medicine, these two societies being especially named because they represented the two European nations most interested in the state of medicine in Mohammedan countries. He suggested that the Persian Government should be first approached and, if a favourable reply were received, that a subscription list should afterwards be opened.

The members of the Section afterwards adjourned to the Wellcome Historical Medical Museum, where Mr. C. J. S. Thompson showed the re-arrangements which had been made during the recess.

PROCEEDINGS

OF THE

ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

LARYNGOLOGICAL SECTION

LONDON
LONGMANS, GREEN & CO., PATERNOSTER ROW
1914

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Laryngological Section.

November 7, 1913.

Dr. D. R. Paterson, President of the Section, in the Chair.

Three Cases of Foreign Body in the Bronchus, illustrating Points of Interest.

By D. R. Paterson, M.D.

(*a*) *Piece of Button removed from Left Bronchus.*—A girl, aged 10, admitted to hospital May, 1913. She was said to have inhaled a small piece of button which she had in her mouth. Beyond a slight occasional cough there were no symptoms, and the child looked well. X-ray examination was negative. Though symptoms were absent, the child gave such an intelligent account of what happened that it was decided to explore the air passages. In the left bronchus, wedged in the branch to the upper lobe, was seen a small, dark body. As the bronchus was small, only a narrow tube was practicable; the fine, telescopic forceps drew it out, but in passing through the glottis it slipped from their grasp. Fortunately it remained impacted in the subglottic space, and was easily removed with the crocodile forceps. The body was a wedge-shaped piece of a black coat-button, $\frac{3}{8}$ in. in size.

(*b*) *Piece of Mutton Bone impacted in Right Bronchus.*—The patient, aged 32, admitted July, 1913, was a hospital-trained nurse, who gave a history that, three weeks before, whilst eating mutton broth, she felt a piece of bone "go down the wrong way." There was choking at the time, which soon passed off, and, beyond an indefinite uneasiness about the chest and an occasional cough, there was a total absence of symptoms. She looked well, had no rise of temperature, and had done her work regularly in her district. Though there were no auscultatory signs, she was "certain it was still there." Accordingly, she was placed under a general anæsthetic, and at the bottom of the right bronchus was found a piece of flat bone $\frac{3}{8}$ in. square. Its sharp edges followed the long axis of the wall of the bronchus, allowing the air to pass freely to and fro. Beyond a slight injection of the mucosa in the immediate neighbourhood there was no sign of irritation, though the bone on extraction had a very foul odour.

(*c*) *Feather, 6 in. long, in Trachea and Right Bronchus.*—A woman, aged 47, admitted July, 1913, had worn a tracheotomy tube for two years on account of syphilitic laryngeal stenosis. She was in the habit of cleaning the tube by pushing down a long feather, and, whilst doing this, a portion broke off and could not be recovered. She came to hospital fifteen hours later, looking very ill, with dyspnœa and wheezing. An attempt to lie down brought on much distress. A bronchoscopic tube was passed through the tracheal opening, and, after clearing the profuse secretions which filled the trachea, the feather was seized and drawn out of the right bronchus. It was 6 in. long and was very offensive. The mucosa of the trachea and bronchus was covered with a dirty grey coating, the lumen being filled with frothy secretion. The patient was very ill for a few days with muco-purulent bronchitis, but afterwards did well.

These cases illustrate (1) variations in the degree of irritation set up by a foreign body in the bronchus. The first two patients had practically no symptoms, and a very clear account in each was the only ground for interference. Even a very septic piece of bone may be tolerated if it does not obstruct the air-way or imprison secretions. On the other hand, the third case shows how serious a condition may be rapidly produced by a septic body. (2) In the first case there was a not uncommon accident in the course of extraction—slipping of the foreign body from the forceps. This is sometimes attended by serious consequences when it falls into the other bronchus. It is a practical problem how best to prevent it.

Removal of a Green Pea from the Right Bronchus by an Improvised Method.

By Herbert Tilley, F.R.C.S.

On August 6, 1913, I was asked to see a man, aged 63, who had suffered from a harassing cough for three days. He said he was eating some peas, when one "went the wrong way." Examination of the lungs revealed slight dullness on percussion over the lower half of the right lung posteriorly; breath sounds and vocal resonance were diminished over the same area.

The lower pharynx, larynx, and upper tracheal regions were anæsthetized with a 20 per cent. solution of cocaine. The bronchoscope was passed into the right bronchus, and, when a quantity of mucus was removed, the pea could be easily seen impacted at the end of the main bronchus. Fearing it would be very soft and macerated, I did not attempt to remove it with forceps or hooks, but passed the end of the bronchoscope firmly on to the pea and then slowly passed a well-fitting plug of wool soaked in liquid paraffin down the bronchoscope until it reached the foreign body. Then, by a sudden but short movement of withdrawal of the piston-plug, the pea was sucked into the lower end of the bronchoscope and removed together with the tube.

It is well known that foreign bodies such as nuts, peas, beans, corn-seeds, &c., which quickly soften and macerate, are peculiarly dangerous when they enter the lower air passages, and are equally difficult to remove. The method above described seems worthy of report.

DISCUSSION.

The President (Dr. D. R. Paterson) added that an interesting case had been reported by Hinsberg, in which a plum-stone had got lodged, in the first instance, in the right bronchus. It was seized without difficulty, but in the act of extraction it slipped from the forceps and dropped into the left bronchus. The patient got into a serious condition, and though the stone was seen and grasped it could not be moved and the woman died some hours later. At the autopsy it was found that the right lung had been entirely shrunken for many years, the patient using practically solely the left lung, which had become blocked up by the entrance of this foreign body. Anything which tended to minimize such accidents was well worthy the attention of the Section. It ought not to be forgotten that a foreign body obstructing a bronchus soon abolishes the respiratory function of that lung, and consequently if it happened to slip from the forceps in the course of extraction it was more than likely to be drawn into the bronchus of the sound side. Brünings had suggested that before attempting extraction, a "bronchus protector"—a small arrangement like a sweep's brush—should be placed in the unaffected bronchus, so that if the foreign body happened to slip from the grasp of the forceps it would be prevented from entering it.

Mr. WESTMACOTT gave an illustration of the importance of paying attention to the statement of the patient. Two years ago a lady was having teeth removed in a dentist's chair, and on recovering from the anæsthetic she said she felt there was something in the windpipe. Upon examination he found nothing there. She did not appear to have irritation or cough, but persisted in her statement that there was something present. On being radiographed no foreign body was seen, by screen or plate. Ten days ago, however, she brought a biscuspid root, with the crown detached, which she had coughed up that morning. There had been an attack of pain, and a violent coughing fit resulted in it being brought up.

Dr. JOBSON HORNE considered that when speaking of mechanical devices to overcome difficulties in relieving patients one could be fairly sure that what appeared to be original had been practised by others. Not only had suction action been resorted to for the extraction of foreign bodies, but some eight years ago a writer suggested the application of some adhesive matter to the end of the piston plug to prevent, if possible, the accident, referred to by the President, of the foreign body slipping away and, perhaps, lodging in another bronchus.

Dr. H. J. DAVIS wondered that soft foreign bodies, such as peas and beans, required so much expiratory effort to cough up, unless they happened to be in one of the large bronchial tubes. This did not apply to those of firmer texture. Such things as needles and steel pins when in the œsophagus were often difficult to find, and hence it had occurred to him to have for such cases a slender rod of iron highly magnetized, and to have the extracting forceps magnetized also. This should greatly diminish the risk of relinquishing the foreign body after once having located and grasped it. Sometimes, though a needle or pin could be seen by X-rays, it could not be found because a fold of mucous membrane enwrapped it. The patient's statement as to the presence of a foreign body could not always be accepted, as illustrated in a case of his. The patient gave a history of having had a foreign body, a pin, in the lung fourteen days. The girl had urgent dyspnœa and seemed very ill. She was taken in and skiagraphed, but without result. Something about the child's appearance made him think of diphtheria and there was found to be albuminuria. On looking into the larynx with the laryngoscope he found no indication of diphtheria, but on passing a bronchoscope he found the trachea and bronchi filled with diphtheritic membrane. This was peeled off by the advancing tube and bled profusely. The pathological report was that it was not diphtheria, but the girl was still in the hospital with diminishing knee-jerks, a rapid pulse, and paralysis of the palate, and, clinically, there was no doubt whatever as to the case being one of diphtheria. The passage of the tube gave permanent relief to the retraction and dyspnœa.

Dr. LAMBERT LACK agreed that the greatest respect should be paid to patients' statements. In the case of adults a definite history of a foreign body could usually be relied on. Alleged fish bones could not always be found, but it did not follow that they were not there. Some years ago a patient came to him with a tooth-plate and teeth attached firmly embedded in the larynx, yet there were practically no symptoms, or so few that the local medical man had advised a change to the seaside to get rid of a slight sore throat. He thought Mr. Tilley's explanation of his case was probably wrong; the piston action did not seem likely to have had anything to do with it; the end of the tube was probably jammed on to the pea, and it was secured in that way.

Dr. DONELAN thought the reason such soft bodies were not coughed up was chiefly physiological. The body was probably first held by spasm, then there was swelling of the mucous membrane followed by absorption of the air in the alveoli supplied by obstructed tube, hence there would in addition be no *vis a tergo* on coughing.

Sir STCLAIR THOMSON said he was surprised to hear that rubber did not show up on the X-ray plate. Last year he had a case in which a vulcanite denture had been lodged in the œsophagus for two and a half years. It had been X-rayed at several Metropolitan hospitals, but they had failed to find it; even with the œsophagoscope it was not found. On the skiagram made for him, however, it showed sufficiently plainly for those skilled in reading skiagrams. Morals could be drawn from these excellent cases, and one of them was that there was no great need for hurry about extraction in certain cases. Knowledge of this fact would do much to obviate the tempestuous attempts at removal sometimes made by practitioners, who were without the special apparatus; and there was time to take the patient to a hospital, or to someone experienced in such matters. The rising generation might well be reminded that in former days the death-rate from the lodgment of foreign bodies in the bronchi was 60 per cent. if operation was not done—and the only operation available in those days was tracheotomy, which reduced it to 30 per cent. Nowadays the figures were probably from 1 to 3 per cent.

Mr. TILLEY, in reply, said that in difficult cases it was very valuable to have a screen examination to guide one in the extraction. In certain instances he thought the invisibility of the foreign body in the lung or bronchi was due to an instantaneous skiagram not having been taken. In answer to Dr. Lack, the foreign body was not attached to the end of the tube, but the suction had drawn it some way up the tube.

The PRESIDENT, in reply, said that when confronted with a soft foreign body in the bronchus he always had some anxiety. He remembered a case in which a piece of bean had been there some time, and was much macerated. Though he got hold of it without much damage, he realized what might happen if it slipped and dropped into the healthy bronchus. He did not think one should rely too much on the X-ray photographs. On the other hand, sometimes bodies which were shown on the X-ray plate were very difficult to find with the bronchoscope, and recently Professor Killian showed him a case which had been in his clinic for some time, and in which repeated attempts had been made to find a foreign body which the radiograph showed. In these attempts with the bronchoscope it was important not to prolong the séance too much, for that added to the risks.

Notes, Specimen and Drawing of Case of Cerebrospinal Rhinorrhœa, with subsequent Ethmoiditis, Mucocele, and Frontal Sinus Suppuration, indistinguishable from Ethmoidal Mucocele; Operation; Death.

By P. WATSON-WILLIAMS, M.D.

THE case here described and illustrated is probably an exceedingly rare instance of cerebrospinal rhinorrhœa, complicated by an intercurrent pansinusitis, and affords an example of an unforeseen contingency which led to a fatal result following a frontal sinus operation. It will be observed that the cerebrospinal rhinorrhœa was diagnosed by inference, but the author feels that the evidence for its existence is sufficiently complete to make it a fair presumption.

(The specimen is shown in the Museum of the International Congress.)

S. H., male, aged 42, plasterer, was admitted to my ward at the Royal Infirmary, January 22, 1913. He had complained of double vision for about four months, but for nearly five years had complained that his sight was "curious." For two years was liable to walk sideways, and for about two years had noticed a swelling in the upper internal angle of the right orbit. He had suffered from recurrent headache for many years, but much more severely for the previous two weeks, chiefly vertical, and once, a day or two before admission, he had vomited. Temperature 99° F., pulse 84. Both nasal passages were completely occluded by œdematous polypus but no purulent discharge was seen. The right eye was displaced downwards and outwards, there was definite exophthalmos, and movements were somewhat restricted. Pupils reacted normally to light. The swelling at the inner angle of the orbit was soft and fluctuating. On the day of admission there was a copious clear watery discharge from the nose for about an hour and a half and the orbital swelling almost disappeared. He states that this had occurred on several occasions before. The diplopia, proptosis, and displacement of the bulb very much decreased, also the headache.

January 26: The orbital swelling is returning, together with recurrence of bulbar displacement, double vision and headache. On January 24 his temperature rose to 99·8° F. owing to a small furuncle in the right auditory meatus, but it has remained subnormal since that day. The patient's general condition very satisfactory, able to be about and to get out in the garden.

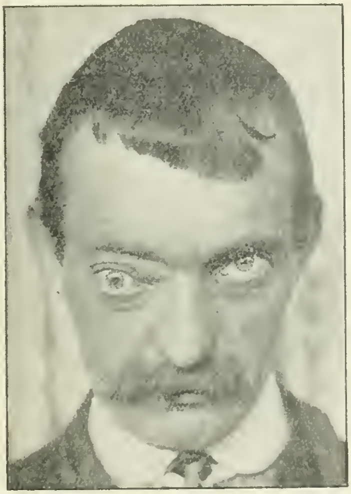

Fig. 1.

Showing the outward, downward and forward displacement of the right eye by the orbital collection of cerebrospinal fluid above the level of the inner canthus, which collection resembled an ethmoidal mucocele.

The diagnosis was nasal polypus with consequent occlusion of ethmoid cells, and as a result of distension an ethmoidal mucocele was supposed to have arisen, emptying itself at intervals, the outer bony wall being absorbed. There were none of the usual signs suggestive of frontal sinus suppuration.

Operation, February 5, under general anaesthesia: The maxillary antra were first explored by the author's exploratory suction syringe.

muco-pus being withdrawn from both. The polypi were removed from the nose and a double intranasal antral operation performed, numerous large polypi being removed from the antral cavities. It was noticed that as soon as the polypi were removed from the right middle meatus the external orbital swelling collapsed. With a view to opening up the orbito-ethmoidal cells, a curved incision was made down to the periosteum, and the periosteum raised from the bone on the inner orbital wall and roof. A gush of pus followed, and on further extending the incision along the lower margin of the hairy eyebrow a fistulous opening in the floor of the frontal sinus was found. The right frontal sinus, which extended upwards for $1\frac{1}{2}$ in. and internally beyond the middle line, communicated with the left frontal sinus through the septum. The frontal sinuses were thrown into one by a Killian operation on the right side, a very free communication being made into the left nasal passage by enlarging the left fronto-nasal passage, by complete removal of the left fronto-ethmoidal cells of the frontal septum and of the upper half inch of the corresponding portion of the nasal septum. But before this a remarkable feature in the inner orbital wall was noted—viz., that the dura mater was exposed by a dehiscence or absorption of the bone over an area of about $\frac{3}{4}$ by $\frac{1}{2}$ in., corresponding to the region indicated in the drawing (fig. 2) as a dark patch. The dura pulsated and care was taken to avoid wounding it, and as far as possible the whole operated area was made aseptic before closing the wound externally.

February 6: Temperature rose to 102° F. Patient vomited several times. Tube removed.

February 7: Temperature rose to 103·4° F.; vomiting.

February 8: The patient morose but mentally quite clear. The wound looking healthy and healing rapidly.

He became rapidly worse at 2 a.m. on February 9, and died at 3.25 a.m. The post-mortem examination showed that the patient had died of acute meningitis, and that this was obviously due to infection through a very small anatomical communication through the dura mater near the inner border of the area of dura mater exposed at the time of the operation. This suggested that the patient must have had cerebrospinal rhinorrhœa. Inquiries from his brother seemed to confirm this view, as he stated that the patient had recurring headaches from boyhood, that from the age of 16 he used to suffer from peculiar colds with dripping of clear water lasting for days. Probably he had had cerebrospinal rhinorrhœa, then having developed antral suppuration with subsequent formation of nasal polypus and also frontal sinus suppuration, the escape of cerebrospinal fluid from the ostium in the dura mater down the nasal passage became obstructed by the growing nasal polypus. Consequently it formed an external swelling with bulbar displacement, and every now and again the collection of cerebrospinal fluid erupted itself through the nose.

The misfortune of such a condition occurring in association with frontal sinus suppuration must be exceedingly rare, but infection through the open portal leading directly to the subarachnoid space was inevitable, and I regret very much that the possibility of the patient having cerebrospinal rhinorrhœa had not occurred to me, and, therefore, that no means were taken to examine the escaping fluid with that in view.

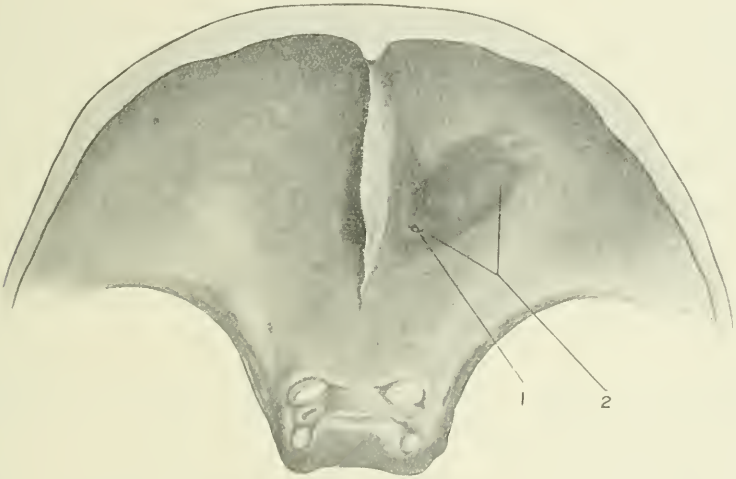

Fig. 2.

1, the opening in the dura mater through which it is presumed the cerebrospinal fluid escaped into the right nasal passage; **2**, the dark patch corresponds to the area in the orbital roof where bone was absent and the dura mater lay in contact with the orbital contents.

DISCUSSION.

Mr. Somerville Hastings said that early in the present year he had had a somewhat similar case. A woman came to Middlesex Hospital complaining that, eight weeks before, she had had much pain in the neighbourhood of the right eye associated with fever and that a swelling then developed. Mr. Lang asked him to see her. The right globe was pushed outwards, and there was a large, tense, fluctuating swelling to the inner side of the right eye. He punctured this, and drew off dark-brown thick fluid, which bacteriological examination showed to be sterile. By feeling about in the cyst with the end of the needle he found there was a communication with the frontal sinus. He operated, and as the septum was much deflected, he did a submucous resection. The right middle turbinate was then seen to be glued down to the outer side of the nose, and when he removed it a large quantity of the same dark-brown fluid came out, and a probe passed easily into a thick dilated frontal sinus. The patient did well for two days, and then suddenly developed meningitis and died on the fourth day. At the autopsy there was no injury to the dura, but the pressure of the fluid had caused absorption of the bony walls of the frontal sinus, so that the mucous membrane of the sinus was in contact with the dura. The meningitis was most marked at the base of the brain and was almost entirely absent in the frontal region.

Sir StClair Thomson said that in his book on the cerebrospinal fluid he had referred to a case published in full by Mermod. There a very similar occurrence took place, and the author regretted he did not collect the fluid. At one time it was thought that cerebrospinal rhinorrhœa affected only young people, but cerebrospinal rhinorrhœa had been proved in patients up to 65 years of age; it might occur at any age, and in either sex. All the published cases had ended fatally. He had collected reports of twenty-three. When there was sinusitis the slightest touch, though the instruments were aseptic, appeared to set up fatal meningitis.

Mr. Clayton Fox asked whether the pyrocatechin reaction had been tried.

The President asked whether, if the nature of such a case were known beforehand, one should abstain from operating. His question was founded on Sir StClair Thomson's remarks.

Dr. Watson-Williams replied that no opportunity occurred for collecting the fluid, and examining it. He did not suspect cerebrospinal rhinorrhœa before operating, and no pus was observed in connexion with the discharge of fluid and he had regarded the "clear fluid" as simply mucus. From the examination of the specimen he concluded that the dehiscence was congenital; there was a large area of dura mater exposed. He first of all opened what he at first thought was the ethmoidal mucocele; but when he found suppuration in the frontal sinus, he was proceeding to do a Killian's operation, when he found that the raspatory in elevating the periosteum was not against the bony orbit, but in contact with the membrane where it was exposed in the roof of the orbit. In the specimen a small round pin-point opening existed during life, and had a perfectly even margin. In reply to the President, one could not argue from a single case, but had he had a suspicion it was cerebrospinal rhinorrhœa, he would not have operated.

Case of Endothelioma of the Ethmoid.

By Dan McKenzie, M.D.

The patient, a woman, aged 23, came under my care in May of this year. For about a couple of months she had been noticing some stuffiness in the right nostril, and a fortnight before her first visit to the hospital she became aware of the presence of a small swelling on the right side of the bridge of the nose. This swelling, which at first sight looked more like a hæmatoma from a trauma than anything else, turned out to be an extension through the right nasal bone of a growth in the ethmoidal region. Further examination revealed a second extension of the growth into the orbit, where it could be felt deep to the inner canthus. The eyeball was markedly displaced outwards, but there was no diplopia. Intranasally, there was very little to be seen. The middle turbinal seemed to be fuller and lower than normal, but no sign of new growth could be discerned. Probing the ethmoidal region, however, set up very free bleeding.

The diagnosis of ethmoidal tumour, probably malignant, led to operation on May 15. The nose was opened through a lateral incision traversing the protuberance on the nasal bone, and the whole mass, light, loose and very vascular, was scooped out with sharp spoons. It seemed to be growing from the cribriform plate, and it involved the whole ethmoidal labyrinth on the right side, including the middle turbinal. A flattish mass about the size of a terminal digit lay in the orbit, the mesial bony wall of which had been destroyed. In addition to that, and to the window in the nasal bone through which the tumour had reached the subcutaneous tissue of the nasal bridge, there was also a fenestra in the ethmoidal septum. Save for rather free bleeding the operation presented no difficulties, and healing by first intention resulted, except at the spot corresponding to the lump on the nose, where the wound remained open for some weeks. It is now entirely closed, but an adherent depression marks this spot.

There is, so far, no sign of any recurrence.

Unfortunately, the specimen was not suitably preserved, and when Dr. Wingrave came to examine it he hesitated to commit himself as to the nature of the growth. It "looked like endothelioma."

The PRESIDENT said that there was an advantage, when dealing with extensive intranasal malignant growths, in a combination of the Denker and the Moure operations. He did that ten days ago in a case of sarcoma where the disease was very extensive, involving the antrum right up to the frontal sinus. The combined operation enabled him to clear out the whole interior of the nose.

Case of Epithelioma of Floor of the Mouth and Tongue, and Ulceration on the Palate.

By W. M. MOLLISON, M.C.

J. C., AGED 72, was shown at a meeting of the Section in June last.[1] At that time he had a movable whitish mass under the tongue and ulceration on the palate (a coloured picture of his condition was shown). The surgeon under whom the patient was admitted considered that operation was inadvisable; the man had therefore been having treatment with X-rays. The ulceration on the palate had changed very little either in extent or in appearance and its pathology was still *sub judice*. The mass under the tongue had developed into a typical ulcerating epithelioma deeply invading the tongue.

DISCUSSION.

Mr. HERBERT TILLEY considered the ulceration on the palate to be epithelioma. It was uncommon to find a growth on the floor of the mouth and unconnected with another growth of the same nature on the soft palate. At the present time he had under his care an old man who had syphilitic scars and granulation areas in the soft palate. From time to time during the past two years these granulations had disappeared under local and general anti-syphilitic treatment, but recently one small area had refused to heal; it had increased in size and now presented an everted edge which histological examination showed to be epithelioma. In Mr. Mollison's patient it would be easy to remove a piece under local anæsthesia and submit it to the microscope.

Mr. DE SANTI asked whether Mr. Mollison had any idea of operating on the epithelioma. He regarded the case as hopeless, and would recommend diathermy; very good results had been shown after diathermy by Mr. Harmer in such cases.

Mr. HARMER regarded both growths as epitheliomata, and did not think such cases were excessively rare. During the last two years he had seen two cases with two epitheliomata in the upper air passages, about 2 in. apart. One man had epithelioma of the lower lip and a separate growth involving the tonsil and part of the tongue. The other was a man from whom he removed an epithelioma of the soft palate, and shortly afterwards discovered that there was an advanced growth between the epiglottis and tongue. As there had been no symptoms, the laryngeal growth had been overlooked. In the present case he believed the greater part of the disease could be destroyed by diathermy. He would treat the front of the mouth first and afterwards the palate, if that were found to be malignant.

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[1] *Proceedings*, 1913, vi, p. 193.

Mr. A. J. WRIGHT agreed with Mr. Tilley that the growth on the palate was epithelioma. Two years ago he saw a man who had had his tongue removed for epithelioma, and six months after operation was found to have epithelioma of the œsophagus, which led to the death of the patient: the nature was verified post mortem.

Mr. CLAYTON FOX said that in view of the multiple nature of the growth it would be well to know whether the Wassermann reaction had been tried, and whether the patient had had leukoplakia, and been an ardent smoker or imbiber of spirits.

Mr. MOLLISON replied that he was not aware that the patient had had any leukoplakia. The Wassermann reaction was negative, though the result was not very satisfactory as the patient was already taking iodide. No operative treatment was suggested, as the growth was too extensive. He would try diathermy, though his previous experience of the method had not been very good; possibly he had been using the wrong applicator. If possible, he would remove a small piece from the palate for microscopical examination.

Case of Pneumococcal Infection of the Pharynx and Larynx.

By PHILIP TURNER, M.S., and W. M. MOLLISON, M.C.

H. F., AGED 23, was admitted to Guy's Hospital in April last, under the care of Mr. Turner, on account of tenseness and a brawny swelling in the right submaxillary region; this was incised under an anæsthetic. During the course of the operation the patient developed so much dyspnœa as to necessitate a laryngotomy; the tube was removed in a day or two and the patient made a fair recovery, though he had all the time some swelling about the pharynx and tonsils. In July the patient was readmitted with increasing dyspnœa. Tracheotomy had to be performed and ever since the tube has been worn. Examination of the larynx before readmission had shown œdema of the epiglottis and arytænoid regions.

In August a further examination of the patient was made under an anæsthetic; it was found that the soft palate and uvula were œdematous and the tonsils large and ragged. The right tonsil contained a cavity into which the tip of the finger could be introduced; it was enucleated, and on bacteriological examination a pure culture of pneumococcus was obtained. The œdematous epiglottis was punctured and cultivations taken from the serum obtained; these cultivations showed pneumococcus and Bacillus catarrhalis.

The patient still has much swelling about the upper aperture of the larynx, and is unable to dispense with the tracheotomy tube. The temperature has varied from 99° to 97° F., except for two days following the tracheotomy. Two weeks ago the patient had a quinsy on the left side.

DISCUSSION.

Dr. Dan McKenzie said that two years ago he showed a case which this reminded him of—a woman, a cook, well over middle age. The disease first simulated sarcoma of the pharynx; there was great œdema of pharynx and larynx, and neck, the hollow of the neck being filled up. The œdema slowly spread to the larynx below the glottis. He tracheotomized early, and she wore her tube eighteen months. Finally, after many vicissitudes the tube could be dispensed with, and she was able to return to her work. There still remained some subglottic stenosis in the cricoid region, of a cicatricial character, and her breathing was somewhat impeded; otherwise her condition was as good now as it was before her illness. He suggested that a similar course of events might occur in this case, and the patient recover; that is to say, we were dealing in these cases with a slow pneumococcus infection of the cellular tissue, slowly advancing, slowly retreating, and finally slowly disappearing, with little scarring or contraction.

The President asked whether serum had been tried. He had himself tried it in one case but without any very good result.

Mr. Mollison replied that a pneumococcal vaccine had not been tried. Since this case he had seen two of pneumococcal infection of the epiglottis or larynx at Guy's Hospital. The first was a woman of the type mentioned by Dr. McKenzie; her epiglottis was so much enlarged that she had some dyspnœa and dysphagia. He punctured the epiglottis, cultivated the serum, and found a pure growth of pneumococcus. She got well in four or five weeks. The other case he saw a week ago, and here also there was much swelling of epiglottis and arytænoids. On puncturing the epiglottis, he obtained a growth of pneumococcus. That patient was also slowly recovering.

Mr. Philip Turner, in reply, said that although no vaccine had as yet been used for this patient, he was slowly recovering; he could now get some air through the larynx.

Tumour of the Soft Palate.

By THOMAS GUTHRIE, F.R.C.S.

THE patient, a boy, aged 8, who had been operated on at another hospital for adenoids two years previously, was brought to the Liverpool Royal Infirmary by his mother, who thought that the adenoids had recurred. No adenoids were present, but a pedunculated mass, the size of a small bean, covered with smooth mucous membrane, was found hanging from the margin of the soft palate about ¼ in. to the right of the uvula. The tumour was removed and is described by Professor Ernest Glynn, of Liverpool University, as presenting for the most part the ordinary structure of a mixed salivary gland of the submaxillary type. In this specimen the mucous glands predominate over the serous. Cells are present also which correspond to the demilunes of Heidenhain. The remainder of the tumour consists of a mass of lymphoid tissue with crypts lined by epithelium like a tonsil; the outer surface is covered with squamous epithelium.

DISCUSSION.

The PRESIDENT said he thought these glands were very much like glands met with in the soft palate of the rat, which were regarded by the biologist as of the type of mucous gland.

Dr. H. J. DAVIS said he had not seen the case, but asked whether it was possible that a piece of adenoid tissue had got implanted on to the palate; he had seen such fixed on to the back of the pharynx after incomplete removal.

Mr. GUTHRIE replied that he did not think it was adenoid tissue, as it showed lobules and resembled salivary gland. He had not found any record of a similar case. There were cases recorded of so-called mixed parotid tumour in connexion with the palate, but he regarded them as endotheliomata.

Fixed Crico-arytænoid Joint; Phthisis; Healed Tertiary Syphilis.

By T. B. Layton, M.S.

A woman, aged 34, was being treated with X-rays for a skin lesion on the lip. Complaining of a sore throat, she was sent to the Throat Department, where it was found that she had a tertiary syphilitic ulceration of the pharyngeal wall. The Wassermann reaction was positive. She was given salvarsan and a course of mercury, and the pharyngeal condition cleared up. She has also a fixed left crico-arytænoid joint which she says she has had since she was 15, and which followed an acute specific fever. Dr. French reports that signs of phthisis are present at both apices, and that tubercle bacilli and elastic fibres are present in the sputum.

Mass attached to Laryngeal Wall.

By T. B. Layton, M.S.

G. K., a woman, aged 41, was referred by Dr. Govan from the Bermondsey Dispensary for the Prevention of Consumption. She says she has had a short, dry cough since birth. In 1911 she consulted a doctor for cough and hoarseness. In August, 1912, she went to another who had the sputum examined and tubercle bacilli were found in it. She was first seen by Dr. Govan in November, 1912, when she complained of cough, hoarseness, and languor, and had a temperature of 100·4° F., with physical signs of limited active disease at the right apex. Dr. Govan examined the larynx and found that "the cords did not meet on phonation, the left arytænoid was reddened, and a small nodule was seen on the epiglottis near the tip." During the night of November 12, 1912, she had a hæmoptysis of a few ounces. She was sent to a sanatorium near Cheltenham and returned to London in October, 1913. When first seen ten days before the meeting the whole larynx was acutely red; peeping out from under the front end of the left false vocal cord was an intensely red polypoid mass. On the anterior surface of the left arytænoid process there appeared to be some ulceration. On the day of the meeting one week later the larynx was much better. The polypoid mass still projected, but was now of a pink rather than a red colour, the general laryngitis was well, the condition of the arytænoid process nearly so. There are now no signs of active tuberculosis in the lung.

The PRESIDENT suggested that the mass might be a prolapsed sacculus laryngis.

Case of Tumour of Right Vocal Cord.

By T. B. LAYTON, M.S.

S. E., A MAN, aged 24, has complained of a "rising in the throat" whenever he swallows his saliva. He has a subacute pharyngitis with very carious teeth. On examining the larynx a small mass lies attached to the right vocal cord and half covered by it. It is the colour of the rest of the cord, and lies just behind the middle of the glottis, being the size of an ordinary pin's head. Attention to the teeth and a gargle made well the pharyngeal symptoms. No symptoms attributable to the laryngeal mass were present.

DISCUSSION.

Dr. JOBSON HORNE did not regard it as a fibroma, but as pachydermia, for which he counselled rest of voice.

Dr FITZGERALD POWELL thought it was a small fibroma, which should be removed by the guarded cautery.

Mr. DE SANTI advised leaving it alone.

A New Pattern of Knife and Cartilage Scissors for the Operation of Submucous Resection of the Septum, together with Specimens of Cartilage removed by them.

By F. H. WESTMACOTT, F.R.C.S.

THE knife exhibited presents a long and curved blade, with a cross-handle, which gives a firm grip to the instrument. The curve enables the operator to cut the cartilage above and below, in two sweeps; the curved incisions meet posteriorly by intersection. The special feature, however, is the cutting edge of the knife, which is a V-shaped curve and will cut through the softest cartilage, because it always presents a sliding edge, and obviates the difficulty experienced with any transverse blade of a soft cartilage doubling up before it and not being cut through.

The scissors also shown are curved in the same radius as the knife, and the whole incision of the cartilage may be carried out with them. The edges are serrated, to prevent slipping of the cartilage between the blades.

DISCUSSION.

The PRESIDENT said that the longer he continued doing the operation of submucous resection the fewer instruments he relied on. He had now practically abandoned Killian's and Ballenger's knives, and adhered to the ordinary forceps, with which he got out ordinary cartilage and bone satisfactorily. The membrane was very rarely perforated.

Dr. FITZGERALD POWELL thought that the scissors shown would be found most useful. There was often much trouble in starting the incision in the cartilage with the swivel knife. The scissors would be just the thing for this.

Dr. KELSON asked whether the instrument was used only for the cartilaginous portion of the septum.

Mr. WESTMACOTT replied that he did not attempt to remove the bony portion of the septum with a knife, but used punch forceps for that. With a knife one was liable to fracture the vertical ethmoidal or cribriform plate.

Specimens from Successive Cases of Tonsils enucleated by "Matthieu's" Guillotine.

By F. H. WESTMACOTT, F.R.C.S.

THE specimens were taken from seven successive cases operated upon to demonstrate that tonsils may be enucleated by means of "Matthieu's" guillotine, after the upper pole of the tonsil has been dug out and tilted forward by means of the forefinger only.

The Rhinomanometer.

By H. A. Kisch, F.R.C.S.

The instrument has been designed for the purpose of ascertaining whether slight degrees of nasal obstruction are present. It will indicate both inspiratory and expiratory obstruction. The principle of the instrument consists in the measuring of the distance through which a column of water can be moved in a definite time. During the test the mouth is kept wide open. The instrument is a glass tube with a wide nose-piece, and a resistance at the distal end.

DISCUSSION.

The President said the difficulty about these instruments was to apply them in an absolutely natural method, without disturbing the nasal passage. He supposed it was necessary to put the bulb of the instrument into the nostril so as to get the air to go through, the other nostril being closed at the same time. Once the nostrils were touched or influenced, the air-stream was modified.

Mr. Westmacott said the rhinomanometer was useful for demonstrating to patients that nasal obstruction existed. Last week he had a case in which there was complete obstruction of both nostrils, yet the patient declared there was no trouble about breathing through the nose, and there was no snoring. He proved to the patient that it was a physical impossibility to breathe through the nose. It was also useful when obstruction was complained of, and yet there was a free passage. He recently had such a case in a girl claiming under the Workmen's Compensation Act. She had an accident in the mill, which smashed in the nasal bones and crumpled up the septum. She said she could not go back to work because the air was dusty and she had obstruction of the nose. A colleague had removed the turbinal bodies and straightened the septum, and there was even more than the normal amount of airway.

Mr. Kisch, in reply, said that a perfectly normal nose was never seen and it was difficult to determine whether there was slight obstruction. The instrument was designed for this purpose. He had tried to obviate the objection mentioned by the President by making the nose-piece large. This rested in the orifice and the opposite nostril was closed by the thumb pressed upwards in the same way.

A Minute Growth (? Fibroma) on the Anterior Third of the Left Cord in a Woman, aged 36.

By H. J. Davis, M.B.

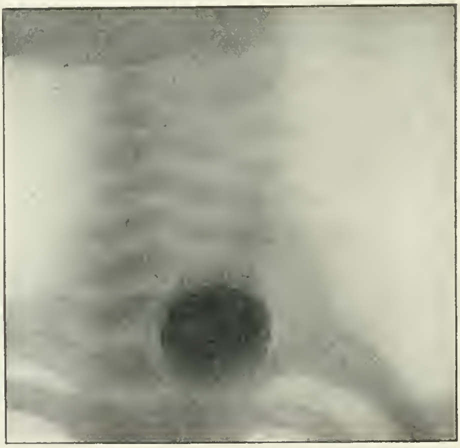
The tumour, the size of a pin's head, is either a fibroma or papilloma and is attached to the anterior surface of the cord, but is very difficult to see owing to its position in the anterior commissure. It evidently drops down between the cords on phonation, causing cough and slight hoarseness.

[November 25: The growth was removed by the direct method with Paterson's forceps, and proved to be a soft fibroma.]

Skiagram showing a Farthing in the Œsophagus of a Child, aged 2.

By H. J. Davis, M.B.

The coin, which was vertically impacted (*see* figure), was removed with the President's forceps by the direct method.



Skiagram of a farthing impacted endways in the œsophagus of a child, aged 2.

Fixation of the Right Vocal Cord, producing no Symptoms, in a Man, aged 61.

By H. J. DAVIS, M.B.

THE patient, a private one, is an actor, aged 61. He came to me for deafness. In the course of examination it was observed that the right cord was drawn to the middle line and, on phonation, the glottis presented the appearance, shape, and direction observed in left complete total recurrent paralysis, although it is the right cord which fails to abduct; this points to the diagnosis of ankylosis of the right arytænoid joint. The patient states that, in 1873, he was operated on in Paris by Isambard, who removed a "fibro-mucous polypus" from the right cord. He was then taken to the hospital and exhibited to the students as a curiosity, as this was one of the first intralaryngeal operations successfully performed in Paris. The patient has no symptoms and the voice is strong and powerful, but the cord is motionless on abduction.

DISCUSSION.

Mr. CLAYTON FOX said he thought that the cords moved both in adduction and abduction; there was hampering of movements of the right cord, but that could perhaps be accounted for by over-use of the voice, inducing functional paresis.

Mr. HERBERT TILLEY agreed that the right cord moved, but the movement was not free.

Dr. DONELAN said it looked rather like abductor paralysis of the right vocal cord in a previously oblique larynx. He would like to know why Dr. Davis abandoned the diagnosis of ankylosis. He had shown several years ago in the old Society a case of a young lady who, during an Alpine excursion, had got sudden laryngitis affecting the right arytænoid body, and having appearances very like those in this case.

Dr. H. J. DAVIS, in reply, said he did not consider that the right vocal cord on abduction moved at all. The man had right abductor paralysis, and the left cord did not adduct normally, hence the glottis was askew. The patient had had no symptoms since the operation, which was in 1873, and did not know there was anything the matter with the larynx.

Case of Peculiar Deformity of the Lower Jaw in a Girl, aged 18.

By H. J. Davis, M.B.

The patient had had four operations for adenoids. There appeared to be no chin, and the report from the X-ray department was that the ascending ramus of the mandible was absent on one side. It was suggested that the deformity might be the result of long-standing nasal obstruction.

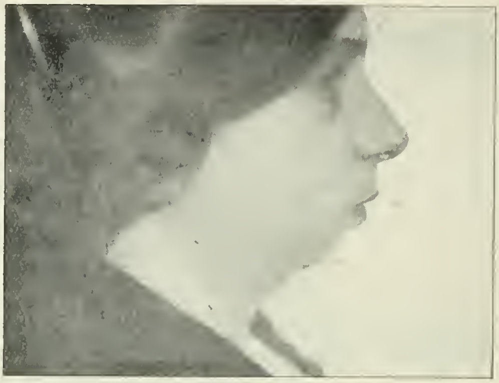


Fig. 1.
Deformity of the lower jaw in a girl, aged 18.

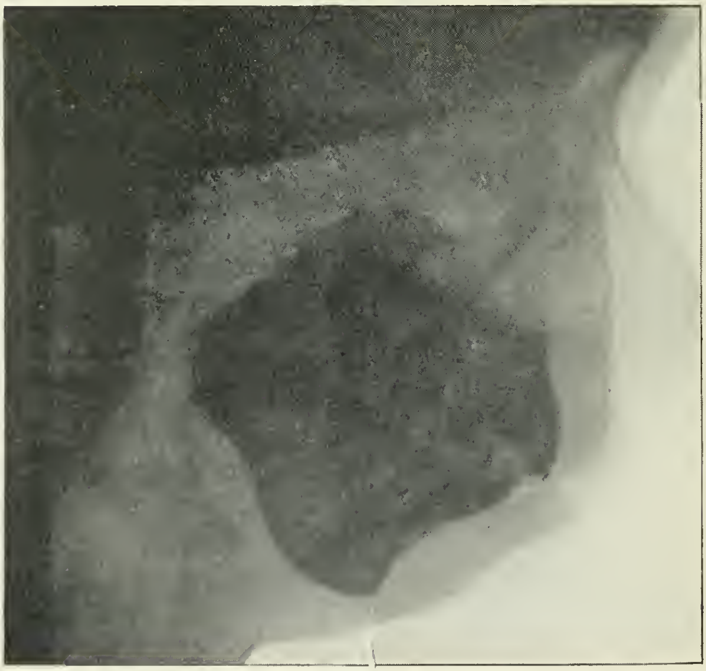


Fig. 2.
Skiagram of the jaw.

DISCUSSION.

Mr. DE SANTI said the ramus was present, and could be felt by putting one finger inside the mouth and another outside. Moreover, he could feel the condyles moving in the mandibular joint. He looked upon the condition as a rudimentary jaw.

Dr. DONELAN said the skull was remarkably simian, especially in regard to the enormous zygoma which, prevented one tracing the short but distinct ascending ramus up to the condyle.

Case of Small Tuberculous Ulcer localized at the Anterior Part of the Left Aryepiglottic Fold, close to the Attachment of the Left Margin of the Epiglottis.

By J. DUNDAS GRANT, M.D.

THE patient is a middle-aged woman suffering from pulmonary tuberculosis. She complained of violent pain on swallowing, which she located in the lower part of the left side of her throat; when asked, she stated that it frequently shot up to the left ear. The extreme pain had been present for a week, but for two months she had complained of a feeling as of something sticking in the throat. The throat was very irritable, and on the first cursory examination no ulcer was visible, but on further closer examination the ulcer described above was to be seen.

The exhibitor has occasionally seen cases of such extreme pain with apparently no visible lesion of the framework of the larynx. He exhibited such a case before the Section in May, 1910.[1] He considers it possible that a similar condition to that existing in the present case—though in a slighter degree—may have been the cause of the pain and eluded inspection.

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[1] *Proceedings*, 1910, iii, p. 117.

Perforation of the Septum Nasi causing Inspiratory Whistle.

By Douglas Harmer, M.C.

Patient had severe epistaxis after boxing seven months ago. Otherwise he had never been troubled by his nose and no operation has been performed. There was a small perforation in the anterior part of the septum, and the whistling noise was produced by inspiration. The whistle could be stopped by plugging the hole. The perforation could probably be cured by a flap operation.

The President said he remembered a similar kind of case, in which the whistling was most noticeable when the person happened to be annoyed. That patient declined a flap operation, therefore he had the hole enlarged, which stopped the whistling.

Case of Epithelioma of Epiglottis, with Extensive Involvement of the Cervical Glands on both Sides, in a Man, aged 63; Removal of Epiglottis and Glands; Present Condition free from any Recurrence.

By P. R. W. de Santi, F.R.C.S.

Male, aged 63. Seen by me in the third week of March, 1913. History of slight sore throat and difficulty in swallowing three months. On examination a well-marked, irregular, hard nodular growth was seen occupying the whole of the left side of the epiglottis, and extending over to the right side and towards left ary-epiglottic fold. Examination with the finger revealed considerable hardness and fixity of the epiglottis. The cervical glands of the neck were extensively involved on both sides. A piece of the growth was removed for microscopical examination, and revealed typical epithelioma. Wassermann reaction negative.

I performed tracheotomy and laryngo-fissure, and removed the epiglottis freely and wide of the disease. Some three weeks later the glands were removed on both sides of the neck, and on the right side I had to remove 2½ in. of the jugular vein. The patient left the hospital two weeks later. The glands microscopically showed typical epithelioma. The case is shown to illustrate the good results that may follow a very free removal of the epiglottis for carcinoma without having recourse to complete laryngectomy, a procedure usually done for malignant disease of the epiglottis, also to illustrate the very extensive implication of the glands in so early a stage. He is at present free from disease, but it is only seven and a half months since operation.

DISCUSSION.

The PRESIDENT said Mr. de Santi was to be congratulated on a most admirable result. He asked whether there was any infection of the interior of the larynx.

Mr. DE SANTI replied that it was an early case, and the disease was limited to the epiglottis. He removed the glands on both sides of the neck, and 3 in. of the right internal jugular. Five glands examined afterwards showed typical epithelioma. There was an early and very extensive implication of the glands in association with such a small growth, and for this reason, as well as to illustrate the excellent results that could be obtained in suitable cases of malignant disease of the epiglottis by free removal without mutilation of the larynx, the case was shown. In former days Mr. de Santi would probably have removed the whole larynx for such a condition, but greater experience led him to adopt when possible a less severe operation.

Large Pulsating Vessel in the Right Portion of the Posterior Pharyngeal Wall, partly concealed behind the Right Tonsil, in a Boy, aged 5.

By J. H. CONNOLLY, F.R.C.S.

THE patient has enlarged tonsils and adenoids, associated with nasal obstruction, and would probably be benefited by their removal. This large blood-vessel is a danger—an uncommon one—and may contra-indicate operative interference. Presumably it is the internal carotid or the ascending pharyngeal artery, or perhaps it may be an abnormal vessel. Its size appears large for the ascending pharyngeal, although it is true that the pulsation is apt to give a wrong impression of the calibre of the vessel. I am inclined to regard it as the internal carotid, and, whilst prepared to remove the tonsils, think it will be wise to leave the adenoids alone. I shall be grateful for the opinions of the members of the Section.

DISCUSSION.

The PRESIDENT said the vessel looked like the ascending pharyngeal, and he did not think there would be much difficulty in removing the adenoids without damaging the vessel.

Dr. H. J. DAVIS agreed that the vessel was the ascending pharyngeal. It appeared to be more at the sides than it really was, as the tonsils were so large, but if they were not there the vessel would be seen to be much nearer the mid-line than it seemed. He would leave the adenoids alone.

Mr. HARMER said he recollected a case at the Metropolitan Hospital in which the house surgeon removed one tonsil, and there was a tremendous rush of blood, obviously from some large artery which had been cut. The bleeding lasted only a few moments, but a few hours later was repeated, and the patient died. Post mortem, the girl was found to have two complete coils in the internal carotid arteries, and these coils pushed in towards the middle line, under the posterior wall of the pharynx; in cutting off the tonsil, one of the coils had been completely removed.

Dr. DONELAN said that Dr. Jacobson, of New Orleans, reported a case in private practice some twenty years ago, in which he had to tie the common carotid before hæmorrhage could be arrested. It was a tonsillotomy. That patient recovered, so it was impossible to ascertain the nature of the abnormality.

Laryngological Section.

December 5, 1913.

Dr. D. R. Paterson, President of the Section, in the Chair.

Three Foreign Bodies, the Colour of which made Extraction more Difficult.

By D. R. Paterson, M.D.

(*a*) *Reddish Seed from the Bronchus.*—A child, aged 4, admitted in April, 1913, was said to have aspirated a small stone which she had in her mouth. There was some cough and wheezy breathing. Nothing was seen by radiography, but there were signs on the left side of the chest with impaired breath sounds. When the child was going under the anæsthetic retching came on, and breathing stopped. It was surmised that the foreign body had got displaced into the glottis, and, as the child was in imminent danger, tracheotomy was done, with immediate relief to the respiration. The interior of the larynx presented a more or less uniform redness, and this puzzling appearance was explained when the foreign body, on extraction, proved to resemble closely in colour that of the laryngeal mucosa. It was a seed $\frac{3}{8}$ in. long, having a red, polished covering.

(*b*) *Pink Ring from the Gullet.*—A child, aged $2\frac{1}{2}$, seen last Boxing Day. It had swallowed a ring, said to be white, concealed in a Christmas plum pudding. The X-ray plate showed it opposite the sternal notch. On passing a tube down, what looked exactly like a transverse œdematous fold of mucosa was difficult to explain until careful exploration made out that it was the ring, not white in colour, but pink. It proved to be 1 in. in diameter—the size of a halfpenny.

(*c*) *Portion of Red Vulcanite Tooth-plate from the Gullet.*—A man, aged 23, admitted in January, 1913, was said to have swallowed, two days previously, half a vulcanite tooth-plate with two teeth attached. An attempt made by his medical attendant with a coin-catcher was given up on the occurrence of bleeding. On examination the œsophageal mucosa, a little below the sternal notch level, was red and œdematous. The red plate was somewhat difficult to make out until the white tooth was localized, and then the bearings were easily obtained. On extraction, it was found to have only one tooth left, the other probably having been pulled off by the coin-catcher. It measured 1½ in. by 1 in., and had sharp corners.

Alongside these I have placed a fragment of nutshell removed from the bronchus (reported to the Laryngological Society, March, 1907 [1]), also showing the reddish colour which made it difficult to distinguish from the inflamed mucosa around it.

The PRESIDENT (Dr. D. R. Paterson) said the cases represented one of the difficulties connected with the extraction of foreign bodies—namely, the close resemblance of their colour to that of the mucous membrane—so that it was difficult to distinguish them. At the last meeting emphasis was laid on the importance of carefully considering the history; these cases showed, on the other hand, that statements as to the nature of the foreign body must be accepted with some reserve.

Epidiascopic Exhibition of Skiagrams and Diagrams of Pharyngeal Diverticula.

By WILLIAM HILL, M.D.

THIRTY slides in all were shown, made up of the following:—

(*a*) Pictures of some typical post-cricoidal pouches in the London Museum.

(*b*) Diagrams by Killian, Keith, and the exhibitor illustrating the anatomical relationships of those herniæ which protrude between the upper or oblique and the lower sphincteric or transverse fibres of the inferior constrictor.

(*c*) Skiagrams of five cases recently seen by the exhibitor; three patients were females; only one had submitted to operation, the pouch being successfully removed by Mr. Ernest Lane.

(*d*) Skiagrams illustrating the method of finding the mouth of the œsophagus by means of a "shotted" string.

(*e*) Skiagrams illustrating circumferential dilations above strictures of the gullet, which in some points simulated the radiographic appearances and symptoms of post-cricoidal pouches.

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[1] *Proc. Laryng. Soc. Lond.*, 1907, xiv, p. 72.

DISCUSSION.

The PRESIDENT expressed the gratitude of the Section to Dr. Hill for his demonstration. He also had found extreme difficulty in such cases in finding the opening into the gullet; in one case he had several sittings, and carefully searched all over, without result. He asked whether, in the cases where the pouches had large mouths, the width of the mouth added to the difficulty and the risk of the operation: some of those illustrated seemed to be practically continuations of the pharynx. He knew two persons who had had such a pouch for years, yet got along fairly comfortably. They had both declined operation, because they were not in robust health; but they had to renounce some of their social duties because of their difficulty of swallowing.

Mr. WAGGETT drew attention to the diagnostic method described by Dunham and Plummer in which the long swallowed string and tube were employed. He had three or four patients with this condition, who, however, lived happily if they syringed out their pouches after dinner with a Higginson's syringe.

Mr. HERBERT TILLEY could sympathize with the statements of the President and Mr. Waggett; the difficulty they referred to was a very real one. Three weeks ago he examined an œsophagus by the direct method. There was some difficulty in swallowing, but very little swelling in the neck. He suspected a "pouch" because of the gurgling sound made by the patient, even during ordinary conversation. At the first attempt he passed the tube easily down the gullet, almost into the stomach, but saw nothing abnormal. He removed the tube and passed it again, but could not enter the gullet, although he was able to get into the opening of the pouch, and with his disengaged hand was able to squeeze from the pouch old evil-smelling debris of food. The pouch was on the right side, and the patient had had it many years. She declined operation.

Dr. DUNDAS GRANT said that in two cases of the kind he had had to deal with, the pouches pointed on the right side. Both were operated upon; one successfully, but the other died.

Mr. T. B. LAYTON asked as to the after-history of the case operated upon. He had heard that the condition recurred because the spot at which one sewed the pharynx wall was weak, and therefore bulged.

Mr. NORMAN PATTERSON said he assisted Dr. Lack in operating upon a case in which the patient seemed, clinically, to have a sac on the left side. When a skiagram was taken it appeared to be mesial and extended to the suprasternal notch. At the operation it was found situated on the left side and was quite small; it did not extend farther down than the lateral lobe of the thyroid. The skiagram of the distended pouch was, in that case, misleading.

Dr. MAURICE HAYES said the last slide shown by Dr. Hill was that of a typical case. In that patient the pouch was on the right side. The second slide, which was not so characteristic, was that of the patient from whom the specimen passed round was taken. The operation was performed by Mr. Dempsey. The other case was not operated on. He did not himself operate, but he made the X-ray examinations.

Dr. FITZGERALD POWELL asked Dr. Hill if he knew what was the mortality after operation? If it was not high, it seemed a pity to leave a patient with a big sac of the kind, to cause so much discomfort.

Mr. E. D. DAVIS, in reply to the question of recurrence after operation, stated that three years ago he collected records of a number of cases in connexion with a report on Mr. Waggett's case. He personally wrote to try and obtain their history, but with the exception of Sir Henry Butlin's and Mr. Bilton Pollard's cases, he could not get it; they had all disappeared. Seven of Sir Henry Butlin's cases were quite well a few years after operation, and Mr. Bilton Pollard's case was well two years later. They had operated by excising the sac. Girard, of Berne, operated on two and Halstead on one by inverting the sac and ligaturing its neck. The after-history of these cases was not procurable. Mr. Waggett inverted the sac and ligatured it in his case, but some months later a recurrence took place and then the sac was excised. The patient was a vagrant, but when last heard of he stated he could regurgitate a little food amounting to about the size of the top of the thumb.

Dr. HILL, in reply, said he was not surprised to find that others had had difficulty in finding the pharyngo-œsophageal opening with the endoscope, which tended to pass into the pouch; to obviate this he used the "shotted" string, which when swallowed could be seen by the X-ray to be anchored in the intestine, and traction could then be made and the string used as a guide for intubating the gullet before and after operation. The operation mortality in sixty cases collected by Stetten[1] in 1910 was something over 15 per cent., but as many operation cases had probably gone unrecorded, more especially the fatal ones, the percentage was probably double that figure. With the improved method of operating in two stages and the use of an intubation apparatus till leakage had ceased, the mortality should be reduced almost to vanishing point. Of those cases which recovered the symptoms were usually reported as cured, which militated against the view that stricture of the mouth of the gullet was the cause of the dilatation of the pharynx and subsequent formation of the hernia between the fibres of the inferior constrictor. General toxæmia from intestinal stasis was said to result in some unoperated cases unless lavage was regularly carried out.

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[1] *Ann. Surg.*, Philad., 1910, li, pp. 300-19.

Case of Sarcoma of the Nasopharynx treated by Radium Emanations.

By HERBERT TILLEY, F.R.C.S.

H. H., MALE, aged 22; first noticed a "blocking of the nose" four months ago. There was no headache nor any pain in or around the nose. An operation for the removal of enlarged glands in the right side of the neck was carried out in a military hospital in September.

The exhibitor first saw the patient in University College Hospital on October 28 and noted the following points: Patient was very pale, and his voice was that of a young man with complete nasal obstruction. The soft palate was pushed forward into the mouth and was almost vertical in position. Behind and reaching just below its free margin a large tumour could be seen, which completely filled the nasopharynx, and the lower rounded border of the mass presented a greyish-white ulcerating surface, from which when manipulated blood oozed freely. A small portion of the growth was removed for histological examination. Digital examination of the growth proved that the tumour had a broad base which occupied the whole posterior wall of the nasopharynx, the only free portions being its lower rounded surface and that which was in contact with the soft palate. A large, soft, painless, ill-defined glandular mass was present under the left ramus of jaw. Two "Emanation" capsules, each containing the equivalent of 40 mg. of radium bromide, were inserted through the anterior surface of the growth about 1 in. apart and left in situ for twenty-four hours.

The patient returned for examination in a week, when the whole mass had entirely disappeared. The appearance of the nasopharynx was as if a large adenoid mass had been removed a few days previously.

On November 25 the patient expressed himself as feeling quite well; all signs of the growth have disappeared, and only a small gland can be detected under the left ramus of the jaw.

Case of Sarcoma of the Nasopharynx treated by Radium Emanations.

By A. J. Martineau, F.R.C.S.Ed.

F. K., male, aged 59, came to me at the beginning of October, complaining of deafness of five or six weeks' duration. On examination the left drum was seen to be retracted, the left side of the nose, of which the cavity was wide and mucous membrane wasted, was filled with crust, and there was similar material in the post-nasal space. He stated that this condition of the nose had existed many years. He was told to return in a week and meanwhile to sniff salt and water daily. Seen again at the end of this period the nose was clean; there was, however, still stuffiness of the left side. A catheter could not be passed into the left Eustachian tube owing to an obstruction in the choana. The soft palate was not quite symmetrical, the uvula being near the right side.

Examined under anæsthetic on October 18, the nasopharynx was found to contain a firm rounded swelling in its left half. The base seemed to be in the fossa of Rosenmüller of the left side; it projected forward into the left choana and crowded the Eustachian cushion outwards and forwards. The prominent portion of the growth was removed and examined by Dr. Galt, Pathologist to the Royal Sussex County Hospital, who reported that the growth was "definitely a large round-celled sarcoma with practically no other tissue present."

Between October 18 and November 14 he had on four occasions X-ray treatment by Dr. Fred. Bailey.

Examined under anæsthetic on November 14, the growth was softer in character. A tube of radium, approximately equal to 47 mg., was inserted from the front through the nose and retained twenty-four hours. The patient experienced relief in about four or five days, and lost his deafness and the nose became clearer.

At the present time the breathing is free and the palate symmetrical; the hearing is good. A raw-looking, ragged surface can be seen from the front.

[*Note.*—January 5, 1914: This has now healed, and there is no visible growth.]

Case of Sarcoma of the Nasopharynx treated by Radium Emanations.

By Somerville Hastings, M.S.

The patient is a labourer, aged 29. On August 11, 1913, he came to the London Throat Hospital complaining that for six months he had had bleeding from the throat, that for five months he had been deaf in the right ear, and that for three months he had been entirely unable to breathe through the nose, and for the same time had lost all sense of smell. He was seen by Dr. Kelson and admitted to the hospital. Dr. Kelson regarded the case as one of inoperable sarcoma, but thought it might be benefited by radium treatment, and as he was going away on a holiday transferred the patient to the exhibitor's care. On examination there was a firm, smooth, pinkish tumour filling up the nasopharynx and pushing the soft palate in front of it. The area visible from the mouth was covered by large veins and bled easily if touched. The man was deaf on the right side and the right membrana tympani was retracted. On August 14 I examined him under an anæsthetic. With considerable difficulty I insinuated my finger between the soft palate and the tumour, and found that the latter was growing from the whole of the posterior wall of the nasopharynx and was firmly adherent to it. I removed a small piece for microscopical examination, and sections of this and also of a second piece removed later are to be seen to-night. The tumour is considered to be a small round-celled sarcoma.

On August 23 the case was transferred to the Middlesex Hospital, and as I was leaving for my holidays, Mr. A. C. Morson, the Cancer Registrar, kindly undertook to treat it. On August 25 a thin platinum tube, containing 82 mg. of radium bromide, was inserted into the growth through a small incision in the soft palate a little to the right of the middle line, and left in place for sixteen hours. After this treatment nasal breathing and sense of smell returned in five days, and the patient was able to hear with the right ear five days later. There was never any reaction seen in the mucous membrane of the soft palate on its buccal aspect. On September 16 all growth had disappeared, but there was slight swelling around the right Eustachian tube and a slough of mucous membrane was visible at the junction of the soft palate with the right lateral wall of the nasopharynx.

On October 10 I again saw the patient, who was quite well. The only abnormalities to be seen then were a small scar on the soft palate and a slight irregular, uneven scar at the junction of the posterior wall of the nasopharynx with its roof.

To-day the patient is in much the same condition as on October 10.

DISCUSSION.

Dr. WATSON-WILLIAMS said one of the most striking features of a relatively short experience of the application of radium was the very different result obtained in sarcoma from that in cases of epithelioma and endothelioma. A few weeks ago he had a very advanced case of epithelioma of the hypopharynx—an utterly inoperable case. The patient had heard of radium and was very anxious to try it. A tube equal to 70 mg. of radium was procured and placed in the growth, and remained there twelve hours, when it was coughed out. Afterwards it was inserted externally, in the glandular enlargement, and for a few weeks the patient experienced a very great degree of benefit, in that she could swallow food, but then she became worse again and died. Even in such cases radium was worth trying, if only to lessen the slow process of semi-starvation, but in cases labelled histologically sarcoma the benefit was much more lasting and might eventuate in apparent cure.

Mr. HOPE said that two years ago he had charge of a patient of Dr. Hill's who had a very large sarcoma in the nasopharynx, was deaf in the left ear, and could not breathe through the left nostril. One radium tube was put into the growth through the nose, and one up into the growth behind the palate. As there was much swelling of the throat, tracheotomy was done. Relief soon came; the tracheotomy tube was removed in eight days and in a fortnight the growth was found to have practically disappeared. The deafness passed off and the nose-breathing became normal. He learned later that the patient had gone on well for eighteen months, that then he had dyspnœa for a fortnight, necessitating sudden tracheotomy, and died.

Mr. WAGGETT said he had a case of chronic enlargement of the tonsil, the distress being so great that it was thought tracheotomy would be necessary. A tube of radium emanation was put into the mass, and left in twenty-four hours, and in five days the growth had disappeared, and the tonsil was even smaller than its fellow. The macroscopical appearance was highly suggestive of sarcoma, but the microscopical findings were equivocal. It was noteworthy that the most highly experienced pathologist found the diagnosis between granuloma and sarcoma one of extreme difficulty.

Dr. JOBSON HORNE considered that it would not be wise to draw from the case exhibited, the conclusion that sarcoma could be cured by radium. In the first place, one had to bear in mind that there was "sarcoma" and "sarcoma," and that it presented different degrees of malignancy. Some years ago he had expressed his conclusions that the nasopharyngeal tumours commonly called fibrosarcomata were not sarcoma in a malignant sense, inasmuch as when allowed to run their course they did not kill by metastases, but by local destruction of adjacent structures: but that they were embryonic growths developing from the basisphenoid. Mr. Tilley's patient was to be congratulated upon being relieved of a tumour by a bloodless method, and the case illustrated the powers of radium in destroying embryonic tissue.

Dr. FitzGerald Powell pointed out that whether these growths in the nasopharynx were typical sarcoma or not, clinically they presented the features of malignancy, and were infiltrating the surrounding tissues. To those, like himself, who had endeavoured to eradicate them by operation—and he had seen cases so treated by Mr. Tilley and others—he was sure they would bear him out in saying the results were often very unsatisfactory, and great suffering endured before the end was reached. Accepting the reports of these cases as correct, he could only say that radium appeared to him to be a perfect godsend in their treatment.

Mr. Harmer said he believed it was generally agreed that with both sarcoma and carcinoma of the upper air passages there was occasionally a complete disappearance of the growth, or almost complete, shortly after the application of radium. But in nearly all these cases recurrence took place, and sooner rather than later. One case was that of a man who had epithelioma of the upper jaw at the beginning of this summer. Mr. Harmer removed the upper jaw freely, but there was a recurrence. On his return from a holiday he found the man had a larger tumour than before, projecting over the face and filling the orbit, the eye having previously been taken away. He put all the radium obtainable into this mass, and left it there forty-eight hours. At the end of three weeks the greater part of the growth had disappeared, leaving a small fibrous lump in the roof of the orbit. He expected that the patient would remain well for a time if it did not bore into his cranium; eventually he would get the usual recurrence and succumb to it.

The President reminded members of the cases that had been brought up of sarcoma of the pharynx which were proved to have disappeared under treatment by arsenic. In one case the glands had been extensively removed by a general surgeon, and the patient came under his own care with a great enlargement of the tonsil. Sir Henry Butlin saw the case, and strongly dissuaded him from operating, but suggested giving arsenic. That advice he acted upon, and the growth disappeared. That happened ten years ago, and it was ascertained a few days ago that the man was still following his occupation. There were cases which disappeared under less heroic treatment than one would adopt for epithelioma.

Mr. Herbert Tilley, in reply, said he was careful to avoid saying his case was "cured"; he did not know whether that would be so. But six weeks ago the condition of the boy seemed as hopeless as it could be, while to-day anyone might think he was normal. He did not think such a result could have been approached by any other method. There was not only a large growth in the nasopharynx, pushing the palate forwards nearly to the teeth, but he had had repeated hæmorrhages, and was very anæmic and weak. When the boy presented himself a fortnight after the application of radium he did not recognize him because he looked so much better. With regard to infiltrating growths, the nearer these approached embryonic tissue the greater the likelihood that radium might do good. In squamous epitheliomata of the mucous membranes radium seemed to do no good at all. He had seen many of the latter in the gullet, but though he had seen improvement in swallowing due to sloughing away of the central portion of the growth, he had seen nothing in the way of permanent cure.

Mr. MARTINEAU, in reply, said that he was told at the Radium Institute that he need not expect a good result in less time than a month; and so, since inserting the radium he had not seen the patient again until to-day. He would have liked to hear whether further radium should be used to prevent a recurrence, or whether one should wait to see what the result would be. The strength was of 55 mg. when sent out, but probably it was 46 mg. by the time it was applied.

Mr. SOMERVILLE HASTINGS, in reply, said that the clinical picture in his case was exactly that described by Mr. Tilley. The patient looked like one suffering from malignant disease; he was thin and pale, had lost all sense of smell, and was deaf in the right ear. Whatever the exact nature of the growth, the result was so far satisfactory, and it was worth while trying the same method for all similar cases which were not amenable to operation.

Two Cases of Bilateral Abductor Paralysis.

By T. B. LAYTON, M.S.

Case I.—G. C., aged 42, was admitted under Dr. Hale White with a history of three weeks' dyspnœa, worse at night. There was some laryngitis and complete loss of abduction on both sides. When in the army twenty-five years ago he had a sore on the penis, for which he was treated with medicine during two months; he had no rash or sore throat. The Wassermann reaction is positive. There are no other signs of locomotor ataxia. Tracheotomy was performed under local anæsthesia; he was given salvarsan, 0·6 grm., and is now on a course of potassium iodide with weekly injections of 1 gr. of mercury. There is now a considerable degree of abduction. He is wearing a tracheotomy tube with a plug, but he never has to take out the plug, even during sleep.

[*Note.*—Sir Felix Semon examined the case and said that the power of abduction being now practically normal, he felt that the original diagnosis must be wrong, and that it must have been a case of syphilitic laryngitis. For he did not believe that, even with the modern methods of treatment which had been used in this case, the abductor fibres could have recovered so completely in two months. Considering the difficulty of diagnosis in such cases, this opinion should be put on record, rather than that the case should be published as one of bilateral abductor paralysis which has definitely recovered in a short time.]

Case II.—A. T., aged 48, attended Dr. French's out-patient department because she makes a "whistling noise" when asleep. She says she gets shortness of breath easily, but has no orthopnœa nor is ever woken up by it. Thirty years ago she had an abscess which burst in the upper part of the front of the left chest; this she dressed herself and did not apply to a doctor for it. Twenty-five years ago she attended at the Brompton Hospital for three months. Dr. French could find no evidence of phthisis, and the only other evidence of locomotor ataxia is that the tendo Achillis jerk is either difficult to obtain or cannot be got at all. Under the X-rays Dr. Lindsay Locke could find no evidence of scarring anywhere in the region of the recurrent laryngeal nerves. There are no signs of syphilis in the fundus or other parts of the eye, nor other signs of this disease about the body. The Wassermann test gave a weak positive reaction. On examination of the larynx there is bilateral abductor paralysis.

The PRESIDENT said he had a case in a man who had this lesion, and in whom on passing a tube there was found, at the root of the trachea, a tumour which had definitely pressed on the trachea: there was laryngeal paralysis owing to this pressure, and consequently a double cause for the difficulty of breathing.

Subglottic Swelling of the Larynx.

By T. B. LAYTON, M.S.

A MAN, aged 40, came up on November 28 with a history of increasing dyspnœa of two weeks' history, which was worse when lying down. On examination the glottis was reduced almost to nothing and the cords could not move outwards. That this was not a paralysis was shown by the fact that a bilaterally symmetrical swelling could be seen immediately below the cords. He was taken in and given salvarsan next morning, with the idea of saving an urgent tracheotomy and in the belief that the condition was syphilitic. Unfortunately no blood was taken for the complement-fixation test before this administration; the patient denies syphilis, and no other symptoms of the disease have been found. On the first night in the ward he made much noise while asleep; he now sleeps quietly, and has no dyspnœa when not exerting himself. The subglottic swelling has largely disappeared, the cords are pink and do not move well on inspiration, the subglottic region opposite the cords becomes diminished, the hinder end of the glottis becomes wider, showing that the arytænoid cartilages move and that the immobility is not due to paralysis. As there are now no urgent symptoms he is to be given a full course of mercurial injections and salvarsan on the Army system, and if this does not cure him a tracheotomy will be done to rest the larynx.

DISCUSSION.

Dr. PETERS said he had seen salvarsan very usefully employed in two cases of obstructive syphilitic trouble; and it obviated tracheotomy. The relief was immediate and contrasted with the results of potassium iodide, which at first increased the dyspnœa.

Mr. BARWELL thought it likely that this patient would continue to get deficient abduction for the rest of his life, because there appeared to be considerable scarring. Salvarsan admittedly worked wonders in these acute cases, but he was not sure that the intramuscular injection of a soluble salt of mercury did not act as well and almost as quickly.

Specimen of Thyro-glossal Cyst, causing Dyspnœa, in a Woman, aged 54.

By A. J. WRIGHT, F.R.C.S.

THIS specimen was removed by operation, having given rise to increasing nocturnal stridor and slight dyspnœa for two years. The cyst presented in the neck over the thyrohyoid membrane, and extended inwards through the membrane, displacing the epiglottis backwards and concealing the larynx.

Mr. HERBERT TILLEY desired to refer to one case in the hope that it might prevent others falling into the error he had committed. A man, suffering from difficulty in breathing, had a large cyst on the laryngeal surface of the epiglottis; it was so large that it prevented a view of the glottis. In colour it was a very pale blue and semi-translucent, and minute blood-vessels were seen coursing over the surface of it. He cocainized it and proceeded to remove it by the direct method, when there was a gush of thin yellow fluid, and the cyst collapsed. He removed all he could of the cyst wall, scored the inner wall with the galvano-cautery, and concluded that all would be well. But the cyst recurred in three or four weeks, and the laryngoscopical view showed that things had reproduced themselves. The man also pointed out a swelling in front of his neck which was painful on pressure. He (Mr. Tilley) then opened from the outside, and let out a large quantity of pus. No doubt the laryngeal operation had infected a large cyst. As the cyst continued to secrete in spite of free drainage, Mr. Trotter, by means of a difficult dissection, excised the cyst, which he found leading into the region of the larynx. The patient eventually made an excellent recovery.

Laryngeal Case for Diagnosis.

By G. POTTS, F.R.C.S.Ed.

H. P. N., AGED 45, a baker, complains of a husky voice and a lump on the right side of his throat. He was quite healthy up to six years ago, when he had rheumatic pains in his joints. He dates his throat trouble to whooping-cough five years ago. There is no history of syphilis. He is a married man with a healthy family. His wife has had one stillborn child, full time. Two sisters died from tuberculosis. Twelve months ago he noticed the right side of his throat began to swell in the region of the thyroid cartilage; for the past three months there has been no change in size. He has had no cough, and is not losing weight; is naturally thin. Has no night sweats. Chest examination shows signs of a healed cavity in apex of right lung. There is a swelling over the right side of the thyroid cartilage about the size of a pigeon's egg, fairly firm and slightly fluctuating. The upper border of the right ala of thyroid cartilage is ill defined, but the cricoid and hyoid cartilages can be distinctly felt. An exploratory puncture has been made and ½ oz. of greenish pus withdrawn.

On microscopical examination by Mr. Archer Ryland the pus proved to contain no tubercle bacilli, and the culture was sterile. On palpating the thyroid cartilage after the puncture the outline of the right ala could be distinctly felt and there was a feeling of a depression in the cartilage.

Laryngoscopical examination: The whole of the right and the posterior half of the left vocal cords are obscured by a swelling bulging into the ventricles. The arytænoids are red and swollen, as is the ary-epiglottic fold. There is no ulceration.

Dr. Wyatt Wingrave kindly did a Wassermann reaction, which proved negative. von Pirquet's reaction proved positive, but no tubercle bacilli could be found in the sputum. A blood count gave 16,400 leucocytes.

DISCUSSION.

Dr. DUNDAS GRANT said it was probably a case of tuberculosis of the thyroid cartilage, producing perichondritis in the first place, and then breaking down.

Mr. BARWELL expressed his agreement with the view of Dr. Grant; he considered the case to be one of tuberculous laryngitis with perichondritis of the thyroid cartilage.

Vertical and Horizontal Gripping Forceps for use in various Tonsil Operations.

By JAMES DONELAN, M.B.

THESE are a modification and, it is hoped, an improvement on those shown by the exhibitor last session. They will be found useful, especially where deeply embedded tonsils have to be dissected out from between the pillars. The tonsil can be seized either vertically or horizontally as may offer the better hold. The spring then locks the forceps and the tonsil is freed from its bed to the desired extent or is dissected completely out. If preferred, a snare or guillotine can be passed over the proximal end of the forceps on to the loosened tonsil and the operation completed in this manner.

A Combined Septal Resector, comprising Knife with Straight and Curved Instruments for raising the Muco-perichondrium.

By James Donelan, M.B.

This instrument consists really of a blunt and sharp-edged tenotomy knife on a longer handle than usual. This form was used originally by exhibitor in the year 1889 for resections of the cartilaginous portions of the septum by flap operation and has been constantly used by him since in cases where only that part of the septum is deformed and in which it did not appear desirable to perform the operation by Ballenger's method. In late years he has added a Freer's curved blunt spatula at the other end. The chief advantage claimed for the contrivance is that no time is lost changing instruments. This is a great gain, especially in cases in which from any cause ischæmia is present, and the operation can often be completed after swabbing without laying down the instrument. When the muco-perichondrium has been freed from both sides of "the bulge" by means of the blunt parts of the instrument the bulge can then be quickly cut out by a process of transfixion and without the aid of angular knives.

Case of Polycythæmia rubra with Chronic Rhinitis.

By E. A. Peters, M.D.

F. C., coachman, aged 58, has suffered for four years with shortness of breath and high colour. Four years ago he was laid up three months with an attack of bronchitis. Two blood counts gave 10,320,000 and 13,000,000 red blood cells. There is marked emphysema present. The nasal mucosa is dark red and swollen; it causes considerable obstruction to breathing. Dr. Lakin has treated him with pot. iodid., sod. sulphat., and vaso-dilators. Local nasal treatment gave little relief, so an anterior turbinectomy was carried out on the left side after giving 20 c.c. of normal horse serum by mouth for five days. Vaseline gauze was packed in the nostril and retained for twenty-four hours, when it was removed and followed by oozing, which necessitated replugging two days later. At no time was the hæmorrhage alarming, though excessive.

DISCUSSION.

Dr. PETERS said the treatment was undertaken to relieve the patient, as he was suffering from obstruction of the nose; and, although there was fear of hæmorrhage, it was thought that slight puncture might help in a measure. He gave the horse serum by the mouth, as it was found to be an excellent way of preventing hæmorrhage. He thought it would be advisable to operate on the other side.

Dr. F. DE HAVILLAND HALL said the bleeding would very likely, in itself, benefit the patient a good deal. Some of these cases of polycythæmia had been benefited by the withdrawal of 8 to 10 oz. of blood, repeated every two or three months.

Case of Infiltration of both Vocal Cords; Deflected Septum.

By E. A. PETERS, M.D.

G. A., A BANDSMAN, aged 23, lost his voice in January; he also lost weight, but no sputum was observed. The voice has recovered from time to time. There is no history of syphilis or evidence of tuberculosis. Both cords are infiltrated superficially and present a mottled rugose surface.

DISCUSSION.

Dr. JOBSON HORNE noted that there was defective nasal breathway. That he regarded as a factor in the laryngeal condition and considered that it should be remedied; more particularly as he understood that the bandsman played a wind instrument.

Sir STCLAIR THOMSON said he wondered whether the question of tuberculosis had been entertained. Both cords were superficially ulcerated, and there was a very mouse-nibbled appearance on both sides. Even if no constitutional affection could be traced, he would still be suspicious of it being tubercle, in an early stage.

Dr. PETERS replied that it was an interesting problem as to whether the condition was tuberculous, or a case of the very rare hypertrophic laryngitis. A resection of the septum nasi would be performed on the following day.

Case of Swelling on the Left Vocal Cord for Diagnosis.

By H. D. Gillies, F.R.C.S.

Patient, a man, aged 50, whose work is in the Stores Department of the L.C.C., has noticed huskiness of the voice since March, 1913. The patient was singing extra loudly at a choir practice, and two days later on reading in the church his voice gave out, and he was unable to continue. Since then there have been various degrees of loss of voice. General health good. Patient has suffered from nasal and post-nasal catarrh. There is deflection of the nasal septum. No sputum can be obtained. Wassermann's reaction is negative. A grey swelling on the left vocal cord is surrounded by an area of inflammation. At the anterior end are two reddish nodules. There seems to be a patch of inflammation below the left vocal cord. The movements of the cords are free.

DISCUSSION.

Dr. Jobson Horne said it was one of the most unusual cases which had been brought before the Section for some time, and one about which it was not easy to express a very positive opinion. By a process of elimination, however, it was possible to arrive at a diagnosis. Tuberculosis and syphilis might be excluded as causes. That reduced the diagnosis to an innocent or a malignant growth of the left vocal cord. The growth was situated in the part of the cord where an epithelioma would develop. Moreover, the movement of the left cord was not so free as that of the right cord.

Sir Felix Semon agreed with Dr. Jobson Horne. He had shown an illustration of a case exactly like the present one on the epidiascope before the International Congress at Budapest.[1] The patient was a man, aged about 50, who had a semi-transparent globular swelling on his left vocal cord, with a slightly granular surface. It remained perfectly stationary for eighteen months, during which he examined the patient at intervals. Then all at once its nature seemed to change, it became malignant, and thyrotomy was performed. In the present case, as Dr. Jobson Horne had already said, the movement of the left cord was defective, and this, of course, did not augur well. Still, there was a distinct history of the hoarseness having suddenly arisen after a big vocal effort, and it was certainly possible that the internal thyro-arytænoid muscle might have been injured, which also would explain the curious appearance of the left vocal cord. He hoped the case would be shown again later.

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[1] *Congrès internat. de Méd. (Budapest)*, 1909, Sect. XV, Laryng. et Rhinol., 1 fasc., p. 2.

Dr. HARRISON said he saw a case similar to this eighteen months ago, and on removal the specimen was definitely epitheliomatous.

Epithelioma of the Soft Palate; Operations.

By NORMAN PATTERSON, F.R.C.S.

MALE, aged 65. About the beginning of May, 1913, he first noticed some difficulty in swallowing and pain in the throat. On examination of the throat a growth was seen involving the uvula and free margin of the soft palate on the right side. There were no enlarged glands. Treatment was carried out in three stages, and consisted of an extensive dissection of both sides of the neck and free removal of the primary growth. An interesting point about the case was the absence, on the right side, of the internal jugular vein. It was represented by two insignificant vessels with numerous cross connexions. The jugular on the left side was abnormally large. Since leaving hospital in August the patient has had X-rays applied at frequent intervals by Dr. Gilbert Scott as a prophylactic measure.

Tooth-plates and Meat Bones removed from the Œsophagus.

By THOMAS GUTHRIE, F.R.C.S.

THESE were shown in order to illustrate the ease with which a vulcanite tooth-plate is detected by a good skiagram and the much greater difficulty of demonstrating the presence of a meat bone by this means. The exhibitor had been informed by Mr. Thurstan Holland that, in the latter's opinion, a vulcanite tooth-plate in the œsophagus could always be discovered by an *adequate* X-ray examination. That foreign bodies of this nature were not infrequently missed was due to a faulty technique on the part of the radiographer. One of the tooth-plates shown by Mr. Guthrie, which Mr. Holland's skiagram

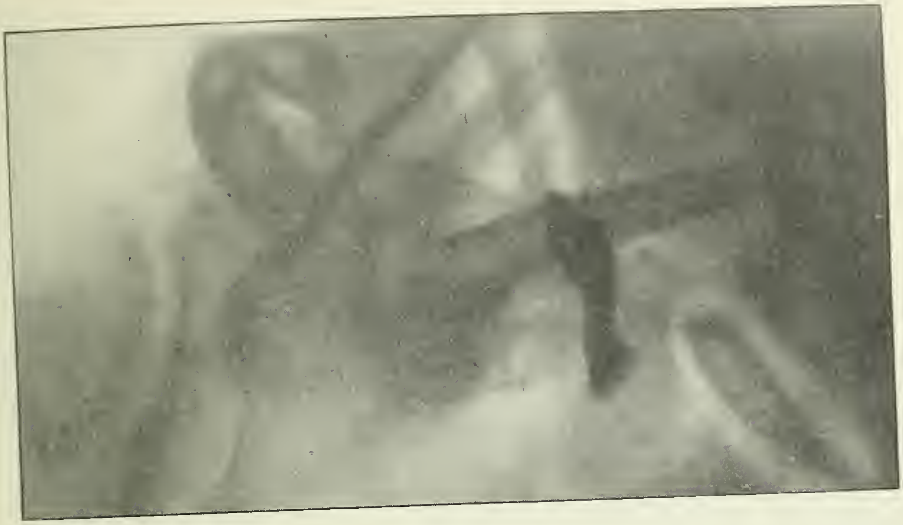

FIG. 1.

Vulcanite tooth-plate in œsophagus; one day. Position on level with clavicle; semi-lateral view. Removed by Mr. Guthrie. (Skiagram by Mr. Thurstan Holland.)

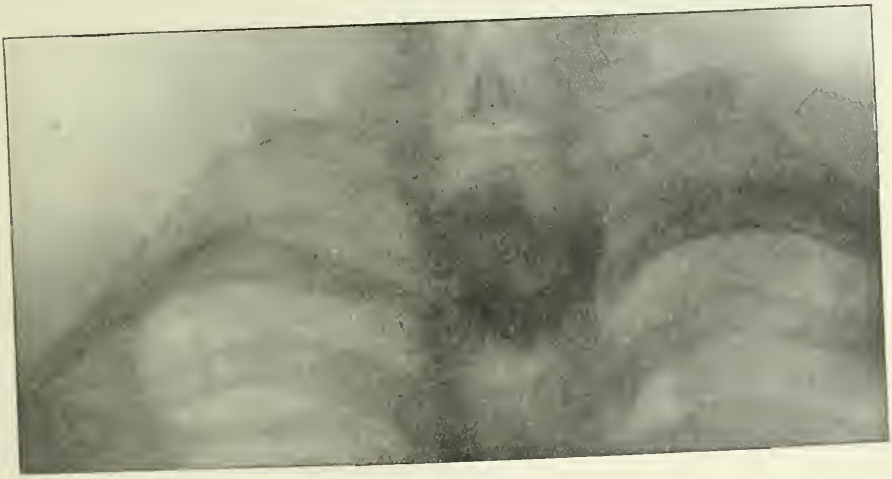

FIG. 2.

Vulcanite tooth-plate in œsophagus for three weeks. Removed by Mr. Guthrie. Note in this case that, on making a screen examination from before back—or vice versa—it was almost impossible to detect the plate whilst the whole screen was illuminated; but when the diaphragm was so narrowed that only a 2-in. square was illuminated, it was then quite easy to see the shadow of the tooth-plate. (Skiagram by Mr. Thurstan Holland.)

demonstrated with the greatest clearness, had been completely overlooked in another hospital, and in another case the tooth-plate was only visible on screen examination, when a diaphragm was employed so that a small part only of the chest was examined at one time. Mr. Holland had on several occasions felt justified in giving a definite negative diagnosis and the tooth-plates had afterwards been found, never having been swallowed at all. Meat bones, on the other hand, were much less opaque to the X-rays and two fairly large pieces which the exhibitor had removed from the œsophagus manifested their presence only by the arrest of a small quantity of a bismuth meal.

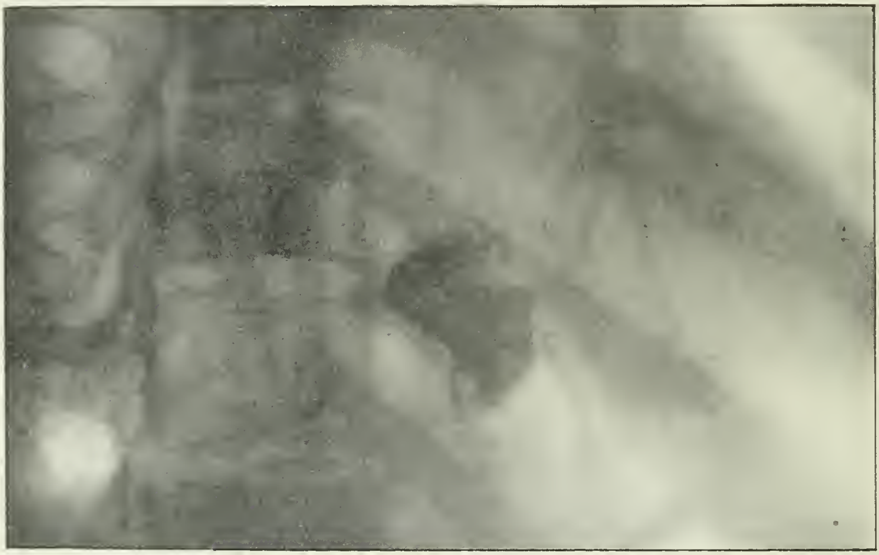

Fig. 3.

Vulcanite tooth-plate low down in œsophagus. Hooks well shown. Three weeks in situ. Semi-lateral view. (Skiagram by Mr. Thurstan Holland.)

The President highly praised Mr. Thurstan Holland's skiagrams. If all skiagrams were as good there would not be so much difficulty in diagnosis.

Trauma from Adenoid Operation.

By H. L. Whale, F.R.C.S.

The patient stated that her adenoids were removed two years ago. She now had a trellis-work of adhesions between the Eustachian tube and the pharyngeal roof, probably the result of lateralizing the curette.

DISCUSSION.

Dr. Peters said he would like to join issue with Mr. Whale as to the condition being due to lateralizing the curette. He believed it was caused by the finger-nail being used to stir up the fossa of Rosenmüller. The best way to deal with these adenoids, which were mostly on the anterior wall, was by means of Meyer's ring knife. If that had been used in this present case, he did not think the condition now seen would have been present.

Mr. Norman Patterson said the condition was very common ; he saw the same kind of thing very frequently indeed.

The President did not think the condition was due to lateralizing the curette, because with the old Hartmann's curette, which most men began with, the condition was but seldom seen.

Sir StClair Thomson said he would be proud to show such a case ; there was no trace left of adenoids. In the days of the old Society there were repeated discussions as to conditions found in Rosenmüller's fossa, and he did not agree that it was necessarily due to lateralizing the curette. These bands did not cause symptoms, and the suggestion of some members to put such patients under chloroform and break down these adhesions because there was some middle-ear catarrh was not justified by results.

Dr. Dundas Grant said there were shown at the Laryngological Society several cases in which there had been no operation in the nasopharynx at all, and in which such bands were present. It was probably in the natural involution of the adenoid tissue that, in favourable circumstances, the stringed form was seen.

Mr. Whale replied that he had not intended to suggest that the condition was either rare or harmful, but had shown it simply because the "trellis" form was so clearly seen.

Case of Aphonia; (?) Congenital Syphilitic Laryngitis.

By W. H. Jewell, M.D.

C. H., boy, aged 14. Loss of voice said to have begun five years ago, following scarlet fever. Boy speaks with forced whisper. The ventricular bands are infiltrated, obscuring the anterior halves of the cords. Arytænoids also swollen. The glottis is unclosed on phonation. There is no evidence of tuberculosis.

DISCUSSION.

The President said the patient had some nasal trouble, there was a good deal of laryngitis, and some crusts were present. He would like to know if the patient had congenital syphilis.

Mr. Edward D. Davis asked whether tuberculosis was likely. The condition of the ventricular bands, the general appearance of the larynx, and the presence of sputum on the posterior commissure were suggestive of tuberculosis.

Sir StClair Thomson did not think an opinion could be given until the nose had been treated. It was common to see cases like this which were simply hypertrophic laryngitis infected from the nose or post-nasal space.

Dr. Jewell replied that his idea of congenital syphilis was strengthened by the rapid improvement under iodide and mercury. The voice also had improved.

[*Note.*—A report has been received since the meeting that the Wassermann reaction is positive.]

Case for Diagnosis.

By F. W. Bennett, M.D.

W. H., tram-conductor, aged 27. Ulceration in right pharynx. Four months ago, hæmatemesis (?). For several weeks, and especially during the last three, has had severe pain on swallowing. No chest trouble detected. von Pirquet's reaction negative. No history of syphilis. Wassermann's test not yet made.

[*Note.*—Shortly after the meeting general pulmonary tuberculous inflammation supervened, causing death in about three weeks.]

DISCUSSION.

Sir StClair Thomson said the case was of much interest, and required to be gone carefully into. He thought the diagnosis might be reduced down to syphilitic disease, tubercle or pemphigus. No pemphigus was found anywhere else, but it was difficult to find the bleb of pemphigus actually out. Even in some fatal cases the bleb had not been seen. He suggested that scrapings should be taken and investigated from the point of view of tubercle or pemphigus.

Dr. Dundas Grant said there was an appearance like that seen in the later stages of tuberculosis, in a more diffuse form. But the intense pain, and the miliary appearance, in spite of the fact that there was leucoplakia on the tongue, made one favour a diagnosis of tuberculosis. Investigations of scrapings were necessary.

Mr. Herbert Tilley thought it was tuberculous, because the epiglottis was œdematous and turban-shaped, and the lesion in the throat was very painful.

Case of Extensive Pharyngeal Growth.

By Herbert Tilley, F.R.C.S.

The patient was a woman with an enormous growth occupying the whole left side of the mouth and pharynx. It had existed for sixteen years and was almost certainly not malignant. Mr. Tilley suggested puncturing it to find if it contained fluid. If not, radium might be tried.

Mr. T. B. Layton said the lump in the parotid region was part of the tumour. There was a swelling beneath the angle of the jaw continuous with the mass in the mouth ; from this a process came round the posterior margin of the jaw which was continuous with the parotid mass. He thought it was a cyst arising in the pharyngeal wall, which bulged the palate down, and that it contained fluid.

Carcinoma of the Party Wall.

By C. I. GRAHAM, F.R.C.S.

THE case was shown in May, 1910. Operation: Total laryngectomy, May, 1910. Shown again at the meeting of the Section in January, 1911.[1] Recurrence noticed October, 1913.

Sir STCLAIR THOMSON said that this having returned after a period of three years showed that extrinsic cancers did not follow the rule laid down by Sir Felix Semon for intrinsic growths. He had found that an intrinsic cancer which did not recur within a year did not come back at all. He advocated the use of radium in this case.

Case of Chronic Laryngitis in an Unusual Form.

By ANDREW WYLIE, M.D.

THE patient, a man, aged 40, by occupation a commercial traveller, a year ago contracted a cold, since when he has been hoarse, becoming gradually worse. Otherwise the patient is healthy. There is no loss of weight, no cough, no spit; nothing abnormal is detected in the lungs. Wassermann's test is negative. Family history good. Upon examination with the laryngoscope there is a redness of both vocal cords, swelling of the right ventricular band and, at the posterior end of the right vocal cord extending into the inter-arytænoid space, a considerable number of little papillary elevations. Slight swelling of the arytænoid cartilages.

The exhibitor intends to apply the galvanic cautery to the small papillæ, but shows the case in order to discuss this treatment.

DISCUSSION.

Dr. DUNDAS GRANT said there were curious warty growths in the inter-arytænoid space. He had only seen an identical appearance in a tuberculous subject who also had had syphilis—a comparatively young man.

Sir STCLAIR THOMSON suggested further research from the point of view of tuberculosis. There were not only papillary growths, but a breach of surface in the favourite areas for tubercle. When the patient was made to phonate, infiltration was seen in the arytænoid regions, and then one saw there was asymmetry, showing it was not physiological thickening but probably a tubercular process.

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[1] *Proceedings*, 1910, iii, p. 142; 1911, iv, p. 55.

Mr. WYLIE replied that he would endeavour to obtain some scrapings from the larynx, and investigate further with the view that it might be tuberculosis. Some of the members thought the case might be malignant.

Case for Diagnosis.

By HAROLD BARWELL, F.R.C.S.

GIRL, aged 15. Nasal obstruction, left side, six weeks. Naris blocked by a polypoid mass, which also fills choana. Left antrum dark on transillumination.

Mr. BARWELL had sent up the case straight from his clinic that afternoon, and had not examined it exhaustively. The antrum, on transillumination, was dark on the left side, clear on the right.

Fungating Tumour of Tonsil.

By HAROLD BARWELL, F.R.C.S.

BOY, aged 16, sent by Dr. Lewes Gibbes. Vaccination three weeks ago, followed by septic arm, fading, purplish eruption on left leg, vaccination marks unhealthy. Sore throat five days ago, no soreness or fever now. Right tonsil converted into large fungating mass with everted edge and very hard base. No enlargement of cervical glands.

DISCUSSION.

Dr. PETERS said he had seen a similar condition, though not so marked, when everted follicles had become septic.

The PRESIDENT said if there had been a rapid history one would suggest sarcoma, especially as it was very firm, and did not look like an inflammatory condition.

Mr. BARWELL replied that the base of the lesion on the tonsil was hard, and it felt and looked like epithelioma. He would report later on the case.

Case of Œsophageal Diverticulum.

By Patrick Dempsey, F.R.C.S.I.

The patient from whom this diverticulum was removed complained of all the typical symptoms of this condition. He was very emaciated, and for the past eighteen months had increased difficulty in swallowing, with regurgitation of food after meals. He was aged 54. Examination with X-rays, and by the direct method, demonstrated clearly the presence of the pouch in the usual situation on the left side of the neck. An incision along the anterior edge of the left sternomastoid, followed by a little dissection, exposed the œsophagus, from the extreme beginning of which the diverticulum originated. This latter, which was quite free, was next clamped as close to the site of origin as possible, and removed. The cut end was closed by a continuous suture, and then two "traction" sutures inserted in the wall of the gullet immediately above and below the beginning and end of the continuous suture already made. This enables one to pull the œsophagus up into the wound,[1] and facilitates the passing of the second row of sutures which engage the muscular coat only. A drainage-tube was inserted in the neck wound, and for the following five days the patient existed on saline enemata, with sips of sterile water, mixed with a little Listerine. On the resumption of feeding by the mouth there was a slight leak round the drainage-tube for seven days, but after this nothing came through, and the patient made an uneventful recovery. Six months later he was in perfect health and had put on 20 lb. in weight.

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[1] W. Taylor, *Trans. Roy. Acad. Med. Irel.*, Dublin, 1909, xxvii, pp. 123-34.

Laryngological Section.

January 9, 1914.

Dr. D. R. Paterson, President of the Section, in the Chair.

Three Cases of Thickening of the Palate and Upper Part of the Larynx, probably due to Congenital Syphilis.

By H. Lambert Lack, M.D.

These three cases show diffuse thickening of the uvula, pillars of the fauces and adjacent parts of the soft palate, and of the epiglottis, arytænoids and upper part of the larynx. The condition is chronic and does not yield to treatment by iodide or mercury or salvarsan. It is apparently stationary or varies very little and shows no tendency to ulcerate. There is occasionally slight difficulty in breathing. The cases are similar to two others I have previously shown, about which differences of opinion have arisen. In all but one the Wassermann reaction has been positive and the diagnosis of congenital syphilis rests entirely upon this. In none of the cases has any treatment been beneficial, nor have microscopical sections of portions of tissue removed thrown any definite light upon the pathology.

DISCUSSION.

The President (Dr. D. R. Paterson) said he felt much indebted to Dr. Lack for bringing out a point which had been obscure. He had seen several such cases and had been at a loss for an explanation, though most of them were before the days of salvarsan or the Wassermann reaction. As none of them improved under anti-syphilitic treatment, one was inclined to put syphilis out of court.

Dr. Dundas Grant said that a similar case was shown before the Section once before, and he had inquired whether thyroid extract had been given in combination with anti-syphilitic remedies, as it had been found that interstitial keratitis in children did not yield to ordinary specific treatment, but a beneficial effect was brought about when thyroid gland was added. He had not had an opportunity of trying it.

Mr. STUART-LOW said he had had two cases of this kind in which ordinary specific treatment was of no use. He had found the application of menthol ointment and massage to the sides of the neck most beneficial. Exercises for the muscles of the pharynx, particularly singing and reading aloud, had been very useful. In all three cases shown the tonsils were large and very septic, and he strongly recommended that they should be enucleated and the adenoids removed. It was quite likely that these septic conditions served to aggravate the pharyngeal trouble.

Mr. HERBERT TILLEY said the point mentioned by Mr. Stuart-Low had also struck him when looking at the first case. As Dr. Lack had a series of cases it would be interesting if he were to enucleate the very large tonsils in the first case. Two of the three cases had abnormally large tonsils, and on that account alone it might be wise to enucleate in order to eliminate any possible septic factor in the cases. He referred to Dr. Brown-Kelly's interesting monograph on the subject, in which there were histological observations on some of his cases. There seemed to be nothing in the paper suggestive of successful treatment.

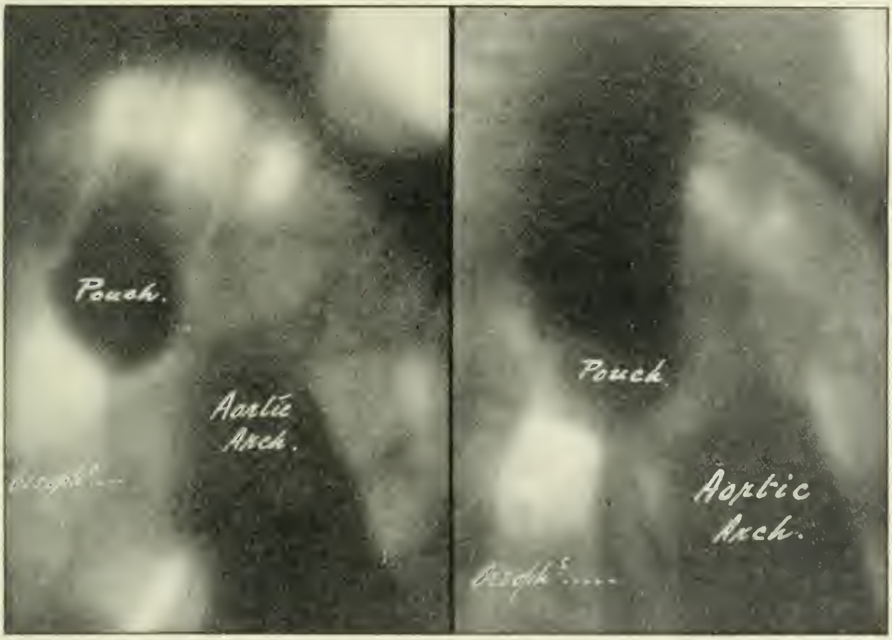
Dr. FITZGERALD POWELL said the odd thing was that despite the use of salvarsan the Wassermann test remained positive. It appeared to be the result of congenital syphilis in which the infiltration and thickening remained. It would be interesting to know if there were any spirochætæ remaining or if any could be found in any of the cases. With regard to the treatment suggested, he was afraid that thyroid extract would not have much effect on them.

Removal of a Large Pharyngeal Pouch under Local Anæsthesia in a Man, aged 70.

By W. H. KELSON, M.D.

PATIENT was admitted into the London Throat Hospital in November, 1913, with the diagnosis of stricture of the œsophagus. He was stated to have had increasing difficulty in swallowing for four years and to be getting steadily thinner and weaker. After careful examination my suspicions were aroused as to the correctness of the above-mentioned diagnosis, and at my request Dr. Jordan kindly made an X-ray examination and clearly demonstrated the presence of a pouch dipping down to the aortic arch and lying behind and a little to the left of the œsophagus. As the patient appeared to be going downhill somewhat rapidly it was decided to operate, and to avoid all risk of post-anæsthetic vomiting I decided to use local anæsthesia. Operation was performed on December 3 after injection of a solution made from three "tabloids" (B. & W.) each containing cocaine mur., $\frac{1}{5}$ gr., morph. mur., $\frac{1}{40}$ gr., along the line of the proposed incision. Hæmorrhage was trifling. It was found necessary to divide the omohyoid muscle. I was assisted by Dr. Lightstone, Registrar.

Report by Dr. A. C. Jordan.—December 1, 1913: The aortic arch shows slight atheromatous elongation and slight general dilatation.



a *b*

Right anterior oblique view.

The posterior mediastinum is clear, except at the level of the top of the aortic arch, where there is a definite shadow. A spoonful of bismuth glycerine (thick emulsion), when swallowed, shot down rapidly to the level of the top of the aortic arch and lodged in a pouch at this level (*a*).

Bismuth emulsion (thin) filled this pouch to the top and then overflowed to the left, running straight down through the œsophagus, and entering the stomach without delay (*b*). The pouch remained full after many minutes and no bismuth passed down the œsophagus, except over the top of the pouch. After drinking pure water the pouch still remained full, and when the patient lay on the couch no bismuth escaped from the pouch in any position. This is a typical pharyngeal pouch, causing difficulty in swallowing by displacing and compressing the œsophagus just above the level of the top of the aortic arch.

January 30, 1914 (two months after operation): A thick bismuth emulsion passed through the œsophagus with perfect freedom, and there was no obstruction or deviation at the seat of the former pharyngeal pouch. A little bismuth entered a slight pit at the level of the epiglottis, but passed out again immediately; this recess is considerably higher than the opening of the pouch and has evidently no connexion with it; it is *not* pathological.

DISCUSSION.

The PRESIDENT said Dr. Kelson was to be congratulated on the case, and the result was very interesting as showing the use of local anæsthesia. It was an object-lesson of what fairly large operations can be done under local anæsthesia, and was the kind of case which was commonly done on the Continent, under this method, though not so often in this country.

Mr. NORMAN PATTERSON asked whether Dr. Kelson found the fundus of the sac at the level that the skiagram showed it to occupy. A skiagram taken in the erect posture, with the sac filled with bismuth mixture, might show the fundus to be lower than it actually was.

Dr. KELSON replied that there was nothing very special about the technique. All that he felt anxious about was lest he should wound the recurrent laryngeal nerve, which was in close contact with the sac; for that reason he was glad the patient was not under a general anæsthetic. That was the reason why enlarged thyroids were sometimes removed under local anæsthesia. He thought the sac passed down to the level of the aorta, because when his finger was enucleating it he could feel the aorta beating on the back of his forefinger. Dr. Jordan, who took the skiagram, would demonstrate the condition on the screen.

Dr. JORDAN demonstrated the skiagrams which he took in this case, and pointed out the characteristics which distinguished a pouch from an organic stenosis. When the patient swallowed the bismuth one saw the pouch fill, and then the bismuth was seen to overflow from the top and run down in a full stream to the stomach. In a case of organic obstruction one could see a thin stream of bismuth trickle down from the lowest part of the pouch. The condition present in Dr. Kelson's patient was now called a "pharyngeal pouch." There was a true œsophageal pouch sometimes seen radiographically, and sometimes accidentally discovered post mortem; he believed it had no clinical significance. In the post-mortem room he had sometimes seen a little fossa into which one's finger could be placed below the bifurcation of the trachea. A fossa of this kind was sometimes seen immediately below the projection always present where the right bronchus crosses in front of the œsophagus. He would like to know if such œsophageal pouches had ever been known to give clinical evidence of their existence.

Three Cases of Sinus Suppuration in Young People.

By Dan McKenzie, M.D.

Case I: Frontal Sinusitis in a Girl, aged 7.—There was a curious history in the case. About three months before she came to hospital the patient was overturned by a bicycle and thrown on her face. A fortnight later pain and swelling in the left supra-orbital region and around the left eye set in, together with headache and pyrexia. After about ten days of fever and headache, the patient being confined to bed, a sudden gush of pus from the left nostril took place. Thereupon the pain ceased, the fever left her, and the child was able to be up and about; but the discharge from the nose continued. When she came to hospital pus was seen to be oozing freely from under the left middle turbinal. A skiagram (exhibited) showed well-marked frontal sinuses on both sides, and the left frontal sinus together with the left antrum threw shadows. Treatment was confined to nasal drainage; the left middle turbinal was removed and nasal antrostomy performed, and the discharge gradually ceased. (Adenoids removed two months ago.)

Case II: Double Maxillary Antrum Suppuration in a Girl, aged 12.—The condition was subacute. After washing out the cavity several times with a Lichtwitz trocar, the radical antrum operation was performed on the left side and simple nasal antrostomy on the right. The discharge has now ceased. (Skiagram exhibited.)

Case III: Left Frontal Sinusitis in a Girl, aged 15; Radical Killian operation; Necrosis of the Bridge.—The patient is now aged 17, her operation having been performed two years ago. The case was one of ethmoidal suppuration with polypi. After free curetting and drainage the presence of headache and local pain led to the radical frontal sinus operation (Killian). The bridge necrosed and was removed a fortnight later, but the wound has healed with very little deformity on account of the natural flatness of the patient's nose. There is still a fair amount of discharge.

DISCUSSION.

The PRESIDENT said the first case was of interest in that the cause was some injury. The influence of trauma in frontal sinusitis came perhaps more often before those who practised in industrial districts, owing to claims for compensation. He had been consulted in regard to one or two such cases. He did not doubt that even comparatively small injuries had some effect in inducing frontal sinus trouble. He remembered a man who had a blow, not severe, on the forehead, which was followed by sinusitis and the discharge of matter through the nose a fortnight later. He would like to hear, in regard to Case II, what principle determined the choice of the radical operation on the left side, and a simple nasal opening on the right.

Mr. HERBERT TILLEY said that for some time he had suggested that these suppurative inflammations were more common in children than they had been supposed to be, or than text-books stated. Some years ago he brought before the Section a boy whose sinus had suppurated in the course of scarlet fever. The boy's age was 8. Last January, during the epidemic of influenza, he saw a girl, aged 9, who had a temperature of 102° F., with great pain on one side of the head. It was due to an acute empyema of the frontal sinus. Under cocaine he had no difficulty in irrigating the sinus, though she was a nervous little patient. After three or four irrigations she got well in ten days. He believed some of the cases of so-called nasal catarrh in children would be found, on investigation, to be sinus suppuration; he was therefore in the habit of transilluminating these cases, especially during influenza or epidemics of acute specific fevers. He was on the look out for such cases, particularly during influenza epidemics.

Dr. DUNDAS GRANT, in reference to the use of the term "subacute," asked how long the maxillary antrum suppuration lasted.

Dr. DONELAN asked what were the reasons, in the second case, for discriminating between the two sides in the nature of the operation. The radical operation seemed unusual for so young a child, and in his experience it was necessary only in about 4 per cent. of even very chronic cases. By making a large drainage through the antro-nasal wall and allowing a reasonably long period of treatment this comparatively small cavity got well without further operation in the vast majority of cases, and in many became almost obliterated within a year or two. Another advantage of this procedure was that even if one had ultimately to have recourse to the Caldwell-Luc operation its severity was much lessened by the existence of the naso-antral opening already made.

Dr. JOBSON HORNE agreed generally with the remarks which had been made, and thought many acute and subacute cases of disease of the accessory sinuses of the nose might, with advantage, be left alone. It was noteworthy how acute and subacute disease in the antrum of Highmore cleared up, and without any exploratory puncturing and washing out.

The PRESIDENT said perhaps Dr. McKenzie intended his second case as a sort of challenge to the Section to debate the point. It was a very practical point as to the kind of case for which the two methods should respectively be used. Moure, of Bordeaux, brought forward, at the International Congress,[1] very definite views with regard to operation in these cases, and the experiments of Ssamoylenko showed that if one wished to obliterate the whole sinus one had to remove completely the whole mucous membrane, and that could only be done by radical methods. With regard to the influence of trauma in the compensation cases on which one was sometimes consulted, the law laid it down that if a blow contributed, or in any way led to the incapacity, that blow was supposed to be responsible for the particular affection; and, whether primary or secondary sinusitis followed, the patient was entitled to compensation. He had two cases in mind: one was definitely primary, there was no previous history, and it healed up soon; in the other case it was secondary—a slumbering sinusitis was stirred up by a blow on the forehead—and intranasal, and subsequently external, operation had to be done.

Dr. DAN MCKENZIE replied that he agreed with what had been said as to the possibility of trauma inducing suppuration, or rendering already existing acute suppuration chronic. He also agreed as to the frequency of such conditions in childhood; in childhood he believed that sinus suppuration was common, because acute otitis media was more common in children than in adults. The reason these cases did not come under their care was that the acute condition passed off in children, owing to the smallness of the sinus and the fact that they were more easily drained. With regard to the second case, in which he did a more simple operation on one side than on the other, he did not do it to throw down a challenge to the Section, but to Nature, and she had answered in an equivocal fashion, leaving one still in doubt as to the best procedure. The assumption was that the simple operation would have sufficed for both sides. The condition was subacute, only of a few months' duration. The cavities had been repeatedly washed out by Lichtwitz's method, but without benefit. The guide to the performance of the radical operation was when ordinary drainage did not relieve or cure the condition—in other words, when polypi were present; then it was necessary to open the antrum thoroughly and to remove the mucous membrane. The diagnosis of polypi in the antrum was difficult. With regard to operating through the canine fossa, the nerves to the canine and bicuspid teeth were cut through; he believed, however, from his study of Dr. Pegler's work on the fifth nerve that, after a time, the nerve supply to these teeth was renewed.

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[1] *Brit. Med. Journ.*, 1913, ii, p. 491.

Dr. DONELAN said, in regard to the diagnosis of polypi, it would often be found practicable to employ a small mirror at the naso-antral opening. If this opening were of good size, and in chronic cases it should be at least as large as a sixpence, a very good opportunity was afforded of thus studying the condition of the mucous membrane and its reaction to drainage and other treatment before deciding on an opening through the canine fossa. An instrument which was an adaptation of Brünings's lamp had lately been devised for examination of the antrum through a naso-antral opening.

Dr. DUNDAS GRANT said he had been able to diagnose the presence of polypi in the antrum while making Lichtwitz's puncture. The point of the instrument felt as if embedded in a soft substance, and his impression was confirmed on operation.

Dr. WATSON-WILLIAMS said that, by the use of the antral suction syringes, one could frequently diagnose the presence of polypi without opening the antrum at all, and both he himself and his house surgeons had very often confirmed such diagnosis by subsequent operation which proved polypoid degeneration. When using this syringe it was not necessary to make an opening into the antrum, as, by the syringe, a little distilled water was passed into the antrum, and whatever matter or discharge existed in the antrum was sucked up into the syringe. When polypi existed they generally obliterated the needle aperture on suction, and he had even removed in this way a core from a sarcomatous growth for examination by the microscopist. If such blockage on suction was not caused by a polypus, there was a neoplasm present, or else exceedingly thick and tenacious secretion. Experience of the use of the syringe in at least 200 cases showed that polypi in the antrum could thus be diagnosed with surprising frequency, and polypi were thus often detected when their presence was quite unsuspected.

Mr. CLAYTON FOX said that Mahu made a point of measuring the capacity of the antrum by injecting fluid into it, recovering it again afterwards by suction. That formed some guide as to the thickness of the mucous membrane. As most subjects of chronic suppuration had polypoid degeneration, it was a test which should not be overlooked.

The PRESIDENT said he had tried most of the methods, and was convinced that nothing but inspection through the canine fossa would give a really trustworthy impression of the condition of the mucous membrane of the antrum.

Cavernous Angioma of the Uvula.

By Dan McKenzie, M.D.

Male, aged 28. The uvula presented an irregular club-shaped appearance. Its cavernous character was sufficiently obvious. No symptoms were complained of.

Dr. Jobson Horne recalled a similar case which was shown before the Section some years ago, in which the palate was mainly affected. In the present case the uvula was mainly involved. He had forgotten whether the galvano-cautery puncture was sufficient, or whether more drastic treatment had to be employed.

Combined Syphilitic and Tuberculous Infiltration of the Larynx.

By Dan McKenzie, M.D.

The patient is a woman, aged about 48. Six years ago she came under the exhibitor's care for tertiary ulceration of the nasal septum, with some redness and thickening of the vocal cords. This was cured by antiluetic remedies. In September, 1913, she returned with general infiltration of the larynx without œdema, ulceration, or any other sign suggestive of tuberculosis; but as the patient complained of cough and expectoration the sputum was examined and tubercle bacilli found.

On October 19 an injection of neo-salvarsan was made, with immediate relief to the symptoms. The voice became clearer and the cough easier. An interesting (? Herxheimer) reaction was observed in the larynx which began the day after the administration of the neo-salvarsan, the mucous membrane assuming a livelier red and appearing to be moister and more succulent. This promise of benefit was not, however, realized. The infiltration increased, and as it was affecting the subglottic region and giving rise to serious dyspnœa, she was again admitted to hospital. On November 14 salvarsan was injected, and the same evening an urgent tracheotomy under local anæsthesia had to be hurriedly performed. It has to be noted that there was no evidence whatever that the laryngeal obstruction had been increased by the salvarsan. She experienced some difficulty with the metal tracheotomy tube, which proved irritating and very productive of coughing, and a rubber tube was inserted, with immediate relief. The coughing had, however, led to a widespread emphysema of the tissues of the neck and thoracic walls.

Since the tracheotomy the larynx has gradually come to assume the typical aspect of tuberculosis with œdematous infiltration of the arytænoids. The galvano-cautery puncture has been used once with some benefit.

DISCUSSION.

Dr. JOBSON HORNE considered that the predominant factor in the case was tuberculosis. In his experience those who came from tuberculous stock unfortunately contracted syphilis, and subsequently developed phthisis, were more liable to laryngeal lesions, and the lesion was usually tuberculous.

Dr. DUNDAS GRANT suggested that there was now sufficient room in the larynx for the patient to breathe without retaining the tracheotomy tube and that the chance of improvement would be heightened if it were possible to do without it.

The PRESIDENT said he now had a case in which the question was whether it was predominantly one of tubercle or syphilis. The boy was aged 13, and there was obvious palate trouble as well as laryngeal. Wassermann's test was positive and tubercle bacilli were said to have been found in the sputum, and he reacted to tuberculin. He improved materially under iodide, and the question was raised whether he should be sent to a sanatorium. The disease in the larynx seemed to hang fire, having improved up to a point.

Dr. DAN MACKENZIE found some difficulty in answering Dr. Horne's suggestion. Six years was a fair time for a tuberculous laryngitis to last, and at first the larynx was much improved by iodide of potassium; the larynx was also much better after the first use of salvarsan. He had hoped someone would allude to the complication which followed the tracheotomy. His experience was that for the first two or three days following tracheotomy the patient required much attention, because awkward accidents were apt to happen, though he had not previously seen emphysema occur. He agreed with Dr. Grant that the cannula might now be removed.

Case of Myasthenia Gravis, with Affection of the Larynx and Soft Palate.

By Edward D. Davis, F.R.C.S.

A woman, aged 25, was admitted to Charing Cross Hospital under Dr. Galloway in February last for Raynaud's disease. She complained, amongst other symptoms, of loss of voice, difficulty in swallowing, and regurgitation of fluids through the nose. The loss of voice occurred suddenly without apparent cause in September, 1912, and was followed a little later by difficulty in swallowing and regurgitation through the nose. When seen in February, 1913, a diagnosis of functional aphonia was made, and in spite of the nasal voice and regurgitation through the nose no paresis of the soft palate was detected. Treatment by the faradic current, cold douching, valerian, &c., had no effect.

At a second examination in June the condition had progressed, the paresis of the soft palate was well marked, the vocal cords abducted slightly, but remained in the cadaveric position during deep inspiration, and on vocalization very little adduction was produced. The pharynx and palate were somewhat insensitive. Organic nervous disease was now suggested, but no definite diagnosis was made. The Wassermann reaction was negative. The condition of the skin was also first noticed then. It was observed on repeated examinations that the amount of paresis varied and appeared to increase when examination was prolonged.

On December 16 Dr. Gordon Holmes saw the patient for the first time and made the diagnosis of myasthenia gravis. This diagnosis is based on: (1) the muscular weakness and rapid fatigue; (2) the variability of the paresis; (3) the increase of paresis on exertion and the difficulty of mastication and swallowing; (4) the affection of the cranial nerves.

DISCUSSION.

Dr. Gordon Holmes referred to the case from the neurological point of view. He did not think there could be any doubt about the diagnosis, as in addition to the facts printed in the notes the patient has occasionally had diplopia during the past eight months, and difficulty in mastication and in talking, especially when tired. Further, various groups of muscles, especially in the upper limbs, could be easily fatigued; some time ago, for instance, she had great difficulty in doing up her hair, and while attending hospital she had always to rest on the way from the Embankment, where she got off the tram, though the distance did not exceed 400 yards. This abnormal fatiguability of the muscles was of course the characteristic feature of the disease; this patient was able to do a certain amount of household work, walk a certain distance and converse with her friends in the morning, but the fatigue in these and all other actions gradually increased as the day advanced. But definite palsies, that is, more or less complete temporary or permanent loss of power of certain muscles, were frequently associated with this fatiguability, and it was an interesting fact, which was supported by the laryngoscopic observations in this case, that such permanent palsies were generally seen only in the muscles innervated by the cranial nerves; he had one case in which complete palsy of certain external ocular muscles had lasted about twelve years. In almost every case there was definite weakness of the orbiculares oris and palpebrarum, and in addition to the persistent laryngeal and palatal palsies, Mr. Davis's patient was unable to whistle and had great difficulty in blowing out her cheeks, and both eyelids and lips were easily separated even when she tried to her utmost to keep them closed.

Dr. DUNDAS GRANT asked whether Dr. Gordon Holmes observed the perverse action of the muscles of the tongue in this patient. The more she tried to obey the request to put out her tongue, the more it seemed to lie in the floor of the mouth, or even to be drawn back. Possibly it was because the posterior fibres of the geniohyoglossus had become fatigued by the examinations. He had noticed the same difficulty in a case of bulbar paralysis. This patient's right vocal cord seemed to be very paretic, but the left one was active, and she seemed to have nystagmus to whichever side she turned her eyes. He asked whether that was frequent in myasthenia gravis or more frequent in disseminated sclerosis. He would also like to hear how, except in very marked cases, one would exclude bulbar paralysis.

Sir FELIX SEMON, K.C.V.O., said he probably was the first laryngologist to observe any participation of the upper air passages in affections of this kind after the disease had been described as a definite entity. The extraordinary thing about the disease was the variability of its symptoms. Mr. Davis, in his notes of the case, spoke of the "paresis of abduction," so that the cords only opened on deep inspiration to the cadaveric position. On examining to-day, however, the glottis was found to open to the full extent, and one could not now say there was any paresis at all of the abductors. He hoped Mr. Davis would put this right, as well as the last line in the description, which stated that the diagnosis was made *inter alia* on the "affection of cranial nerves." He believed Dr. Gordon Holmes would agree that the pathology of this affection still remained obscure—i.e., as to whether it was primarily an affection of muscular fibres or of the nerve end-plates. At any rate he believed no affection of nuclei had ever been found in the disease, nor any organic disease in the cranial nerves themselves. If the present statement of the note were to go forth—viz., that the diagnosis was based upon the "affection of cranial nerves," and that primarily there had been paresis of the adductors, as manifested by the weakness of voice—that would probably be taken as a fresh proof against the validity of "Semon's law," that in progressive affections of the cranial nerves the abductors suffered first. He was anxious to prevent fresh confusion arising.

Mr. **SOMERVILLE HASTINGS** asked if Dr. Gordon Holmes would say what was the usual termination of these cases. Some two years ago he showed a similar case in a boy, whose condition was diagnosed as myasthenia gravis, and three months after being exhibited to the Section the child died suddenly ten minutes after being seized with dyspnœa.

Mr. **DAVIS**, in reply, said that this was the first case of myasthenia gravis he had seen. When Dr. Holmes made this diagnosis he hastened to look up the literature and found six other cases recorded, but a laryngeal examination had been made in only two of them—namely, cases recorded by Mr. Somerville Hastings[1] and Dr. Farquhar Buzzard.[2] Sir Felix Semon examined the larynx of one of Dr. Buzzard's cases. In three of the six cases affection of the palate and larynx was mentioned, but no laryngeal examination was recorded. He had seen the patient at least six times and the point which impressed one was the great variability of the paresis, sometimes even during an examination.

Dr. **GORDON HOLMES**, in further reply, said he first saw the patient a fortnight ago and had examined her since, and each time he found the tongue movements fairly normal, but he noticed that she tired quickly when she attempted to keep her tongue out. In many cases of this disease, however, there were curious longitudinal grooves on each side of the tongue which had been attributed to wasting of the lingual muscles. He had also failed to detect any true nystagmus on the occasions when he examined her, but the ocular muscles tired easily and fixation then became defective. The differential diagnosis of this disease from true bulbar palsy was as a rule not difficult, though in the past many cases of myasthenia had been confused with it, and, indeed, myasthenia was first described by the Germans as *Bulbärparalyse ohne anatomischen Befund*. But in ordinary bulbar palsy the masticatory and ocular muscles were not involved, the weakness was constant and not variable as in myasthenia, and it was always associated with wasting of the affected muscles of the lips, tongue, palate, and vocal cords. The termination of myasthenia gravis was almost always fatal, though some cases, especially those which start late in life, ran a very slow course. The only effective treatment was to keep the patients as much at rest as possible and to spare them from stress and fatigue.

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[1] *Proceedings*, 1911, iv, p. 39.

[2] *Brain*, 1905, xxviii, p. 463.

An Unusual Case of Adductor Paresis.

By Edward D. Davis, F.R.C.S.

E. C., a healthy gardener, aged 47, complained of loss of voice of gradual onset, and that fluids occasionally went down the wrong way, following influenza five years ago. In January, 1910, well-marked weakness of the arytænoideus, with the typical triangular interval behind the vocal processes, and the approximation of the anterior two-thirds of the vocal cords was seen on vocalization. There was no evidence or history of rheumatism or syphilis. Skiagraphy of the chest and examination by the direct method were negative. No fixation of the arytænoideus could be detected. Treatment by faradization, valerian, &c., had no effect.

An examination in June of this year showed that the paresis had progressed considerably and that the adductor paresis is practically complete. The nervous system has been repeatedly examined and on the last occasion by Dr. Gordon Holmes, who found no signs of organic disease.

DISCUSSION.

Sir Felix Semon said the history was unusual, but if he had seen the case without knowing anything of the history, he would unhesitatingly have said it was a case of functional double adductor paralysis. Even now he did not doubt it was functional.

Mr. Herbert Tilley asked what strength of current was used. In a case of bad or chronic aphonia, it was well to give the patient full doses of strychnia and then apply such a strength of current that it would not be forgotten. He also asked if the current was applied extralaryngeally. In one very intractable case he had given a general anæsthetic and examined the larynx under it, then as she was coming round an intralaryngeal electrode was passed so as to cause her to cry out and hear her own voice. The result was successful, at any rate so long as she was in hospital.

Dr. de Havilland Hall said the plan recommended by Mr. Tilley was not always successful. He had a case twenty-five years ago in which the patient screamed out violently, but she still persisted in not using her voice.

Dr. Donelan said he remembered a very similar case to Dr. Hall's, an Irish lady, a patient of Sir Morell Mackenzie. The strongest possible current was used on several occasions through a laryngeal electrode both by Sir Morell and himself. The voice was generally, though not always, restored, but the improvement did not continue more than a day or two. The fact was that no treatment permanently overcame the psychical condition in some of these patients. He had since been informed that the lady referred to had been cured for a long time, if not permanently, by a visit to Lourdes.

Mr. DAVIS replied that he gave the faradic current both extra- and intra-laryngeally; he could not say what was the amperage, but the full strength of the battery was given. The man had five or six applications. When first seen, both Mr. Waggett and he diagnosed the condition as distinctly functional. Strychnine was not given, but he had cold douching, valerian, &c.; even the passage of a bronchoscope was tried. Five years after being first seen he was offered a job as gardener, but the lady, his employer, did not like his hoarse voice, and she wanted a certificate to say that he had no infectious disease of his throat. The present state of the larynx seen on this occasion made it necessary to revise the diagnosis of functional aphonia.

Two Examples of Foreign Bodies removed from the Pharynx by Suspension Laryngoscopy.

By EDWARD D. DAVIS, F.R.C.S.

(1) An open safety-pin with the bent point embedded in the posterior wall of the pharynx of an infant, aged 11 months. The lower or hinge end of the pin was about the level of the upper edge of the cricoid cartilage. By suspension laryngoscopy the pin was well seen and removed by seizing the lower or hinge end with Paterson's forceps and rotating the pin around its point. The point was then freed and the pin removed upside down with the point directed downwards.

(2) A farthing impacted at the orifice of the œsophagus and behind the lower edge of the cricoid cartilage in a boy, aged 4. A previous attempt had been made elsewhere to remove the coin by a coin-catcher. It could not be seen by suspension laryngoscopy, but the œsophagoscope was passed while the suspension apparatus was in position and the coin easily removed. Suspension laryngoscopy materially facilitates bronchoscopy and œsophagoscopy.

Skiagrams of a Pin in the Retropharyngeal Space.

By EDWARD D. DAVIS, F.R.C.S.

A BOY, aged 9, swallowed the pin shown in the skiagrams, and was admitted to Charing Cross Hospital under Mr. Waterhouse. A few days later a prolonged attempt to find the pin by suspension laryngoscopy and œsophagoscopy was unsuccessful. After localization by more skiagrams a second attempt to find or feel the pin was again unsuccessful.

DISCUSSION.

The PRESIDENT said that where the safety-pin was lodged with the hinge downwards and the point sticking up, he had, in one case, passed over the point a very fine tube, which guarded the point while it was being pulled up, particularly when it was in the gullet proper. An instrument had been invented for closing the pin first, and then withdrawing it; but it was difficult to carry a great number of instruments about, and the plan he mentioned was more simple.

Mr. TILLEY asked whether the pin had been looked for with the X-ray screen. He had found that so valuable in one case that he would try it in a case similar to Mr. Davis's.

Dr. E. A. PETERS said he recorded a case in a man, aged 30, who felt a sudden pricking when swallowing food, and was admitted with urgent dyspnœa, necessitating immediate tracheotomy. He was relieved, and sat up and was feeling comfortable, but suddenly died two hours after the tracheotomy. The pin was found transfixing his jugular vein, and there was hæmorrhage right down the spine, causing œdema of the glottis.

Mr. CLAYTON FOX asked whether the application of adrenalin had been tried. Probably the head of the pin was in the pharynx, and the swelling of mucous membrane prevented it being seen.

Dr. KELSON asked whether a powerful magnet had been tried, such as was employed at eye hospitals.

Dr. FITZGERALD POWELL asked at what level in the neck the pin lay, and suggested the possibility of its removal by a lateral pharyngostomy, or an exploratory incision behind the pharynx.

Mr. DAVIS, in reply, said he examined the boy for over an hour with the suspension laryngoscope, with the largest œsophagoscope tubes he could introduce, and by palpation. Dr. Ironside Bruce, who took the skiagrams, said the pin was lying on the vertebral column in the retropharyngeal space. Dr. Ironside Bruce was confident of the accuracy of his localization of the pin, and owing to many practical difficulties, the X-ray screen was not used at the same time and during œsophagoscopy, though this method practised by Mr. Tilley was considered and repeatedly suggested. On the second occasion, Mr. Waterhouse and Mr. Waggett also examined, but we could not see or feel the pin. After the first examination the temperature was 99° F. for one night, and that was the only temperature he had. It had been decided to wait until there was a retropharyngeal abscess, or other symptoms; the boy was still under observation, and if anything occurred it should be recorded. He always used 10 per cent. cocaine with an equal quantity of 1 in 1,000 adrenalin in children, and 20 per cent. cocaine for adults, and in this case he made very free use of it in swabbing the pharynx, base of the tongue, and epiglottis. The first skiagram showed the head of the pin to be at the upper border of the fifth cervical vertebra, which would correspond to the level of the arytenoids, but the pin seemed to have moved upwards since; the point now appeared to be at the level of the soft palate or second cervical vertebra. It was suggested by one of the dressers that a magnet should be used, but there was not one in the hospital, and the pin was of brass or similar metal.

Deflection of the Posterior Part of the Nasal Septum.

By NORMAN PATTERSON, F.R.C.S.

MALE, aged 19½. Patient came to Golden Square complaining of discharge into the back of the throat and other symptoms. Examination shows some displacement of the anterior edge of the quadrilateral cartilage to the left, together with a deflection of the main body of the septum to the left, and a spur on that side. The lower part of the right nasal cavity is abnormally roomy and widens out more and more as it approaches the choanal orifice. On anterior rhinoscopy an exceptionally extensive view is obtained of the nasopharynx and the adenoid tissue present there. Examination with the mirror shows a marked deflection to the left of the posterior edge of the vomer. It is attached in the middle line above, and here it is very broad; as it passes downwards it deviates markedly to the left and its lower extremity is slightly concealed by the posterior end of the left inferior turbinate, which projects beyond it. The posterior end of the right inferior turbinate is separated from the septum by a considerable interval. Further, the edge of the vomer appears to slope much more obliquely forwards than is normally the case, and this accounts to some extent for the posterior ends of the inferior turbinates, which are somewhat enlarged, being on a plane considerably behind that of the lower part of the septum. The soft palate hangs well forward and the pharyngeal isthmus is abnormally wide. The patient gives the history of small particles of food, especially bread, entering the nose and having to be expelled by sneezing or blowing the nose. The hard palate, measured from its posterior edge to the incisor teeth, is more than $\frac{1}{4}$ in. shorter than in other patients of about the same age and build. Antero-posterior measurements of the lower part of the septum give the same result.

On transillumination the antrum is dark on the right side, but puncture reveals no pus in the cavity. An X-ray photograph shows the antrum to be smaller on this side. It is not easy to make certain whether or not there is any asymmetry of the hard palate, but a cast is being made.

Other abnormalities presented by the patient are the absence of a lateral incisor on the left side and a very small one on the right. The uvula is bifid.

DISCUSSION.

Dr. DONELAN thought that these cases were not quite so rare as had been generally supposed. He did not at all agree with the reason for their rarity given in some of even our most recent text-books—namely, that the posterior portion of the septum was the first to be developed. We all knew now that this was not the case. The line of potential weakness during growth extended quite to the posterior border. One reason they had not been more frequently reported was probably that attention was much more given to the anterior portion of the septum, and that while it was true that deformities of the posterior portion occurred rather more frequently than used to be thought along the whole line of the supravomeral cartilage, these were rarely of sufficient importance to attract much attention unless they were so placed and of such a size as to call for operation. During the last six months he had operated on two cases, one at the age of 14 and the other at 20, in which the distortion on the left side extended through the posterior border. Both cases were apparently due to the co-existence of unusually large masses of adenoids.

Dr. DAN MCKENZIE said the whole subject had been worked out by Dr. Brown-Kelly in a recent number of the *Journal of Laryngology*, but he did not know whether the author paid special attention to the sloping of the septum; he had noticed cases in which the septum sloped very far forward. He thought it was related to cleft palate, as there was an absence of a lateral incisor tooth on the left side.

Dr. JOBSON HORNE considered that the deviation of the posterior part of the septum in cases of abnormal development of the nose or the palate, or the antrum of Highmore, was more apparent than real. When the development of the antrum had been arrested the choana was wider on the affected side and the septum appeared to be deflected to the opposite side. The same applied to the wider choana seen in cases of cleft palate on the same side as the cleft.

Mr. NORMAN PATTERSON replied that the case was an extremely uncommon one; he had not seen anything like it previously. He agreed that one could frequently see the posterior end of a spur with the rhinoscopic mirror, but such differed from this case, where the whole septum was deflected to one side. He knew Dr. Brown-Kelly's work on the subject, but the patient's speech did not suggest any insufficiency of the soft palate. Had the condition been due to the extension of the sphenoidal sinus into the vomer the main deformity would have been above; here it was the lower part of the septum that showed the greatest deviation from the middle line.

Case of Laryngeal Neoplasm.

By W. JOBSON HORNE, M.D.

THE patient, a man, aged 46, had had an "irritable" nose all his life, and hay-fever and asthma for twenty-four years. Hoarseness developed with a "cold" ten or twelve weeks ago. Recently there had been some soreness referred to the right side of the larynx, and a little pain now and then passing up to the ear on that side.

The right half of the larynx was almost, if not quite, fixed; the neoplasm occupied the right vocal cord in the entire length; but so far as could be seen it had not crossed over to the left cord. The growth was irregular and sloughy. At the time of taking these notes (December 30, 1913) no glands were palpable in the neck.

The patient was one of a family of twenty-five, of whom twenty-two were living, and the eldest 56.

When the hoarseness developed the asthma ceased.

DISCUSSION.

Dr. JOBSON HORNE supplemented the notes by adding that he had not received the report on the Wassermann test. The patient had been taking iodide of potassium and mercury since December 30.

Dr. DUNDAS GRANT said that the fact just mentioned by Dr. Horne enabled one to see more plainly the striking feature of the case. There was here less eversion of the edges and fungation than in a case of typical epithelioma, and the centre seemed to be sloughing out. It looked exactly what one would expect to see in a foreshortened view of an ulcerated gumma.

Professor BURGER (Amsterdam) agreed that in this case there were two possibilities: that it was a malignant growth, or that it was syphilitic disease. He agreed that most probably it was a syphilitic affection. In favour of that view there were three factors: (1) the glossy, yellowish-white aspect of the tumour and its sharp edge; (2) the dark red colour of both ventricular bands: (3) the fact that not only the left ventricular band was swollen, but the right also. The absence of swelling of the glands did not constitute an argument, but it gave support to the opinion he had expressed. He hoped the report of the Wassermann test would be known, and, later, the result of anti-syphilitic treatment.

Sir FELIX SEMON said that when he first saw the case he felt no doubt that it was a malignant growth. To that view he still adhered, though he might have come to the idea on mere clinical instinct. Of course he was not unmindful of the German proverb that "night-watchmen sometimes died in the day," and his diagnosis might be mistaken, but still he thought it was right.

Mr. HERBERT TILLEY said that for once he differed from Sir Felix in the diagnosis of this case, and agreed as to the points put forward by Professor Burger. There was a curious easy movement of the parts around the ulcer, though he did not suggest that in every malignant case there was necessarily an immobility of the cord.

Dr. FITZGERALD POWELL considered, with Sir Felix Semon, that the case was malignant; he thought so when he examined it, and was still of the same opinion, notwithstanding the history of specific disease mentioned.

Dr. KELSON said he thought it was a syphilitic lesion—viz., a fairly typical gumma, which was breaking down.

Dr. JOBSON HORNE replied that when he first saw the case on December 30 he thought it was epithelioma and he was still of that opinion. However, before operating he would await the result of the Wassermann test and then act accordingly.

Carcinoma of the Soft Palate.

By W. G. Howarth, F.R.C.S.

Ten weeks ago the patient noticed a lump at the angle of the jaw on the left side. It was not painful, but as it increased in size he came to the hospital for advice. He had not noticed anything wrong with the mouth or throat. A large mass of glands infiltrating the left sterno-mastoid have been removed. During the last few days considerable discomfort has been noticed on swallowing.

DISCUSSION.

The President asked whether Mr. Howarth thought it necessary to remove the glands on the other side. The growth on the palate seemed to be dangerously near the middle line.

Mr. Norman Patterson said that in the case of malignant growths affecting the uvula and the central part of the soft palate, even if small, the glands on both sides of the neck should be completely dissected out.

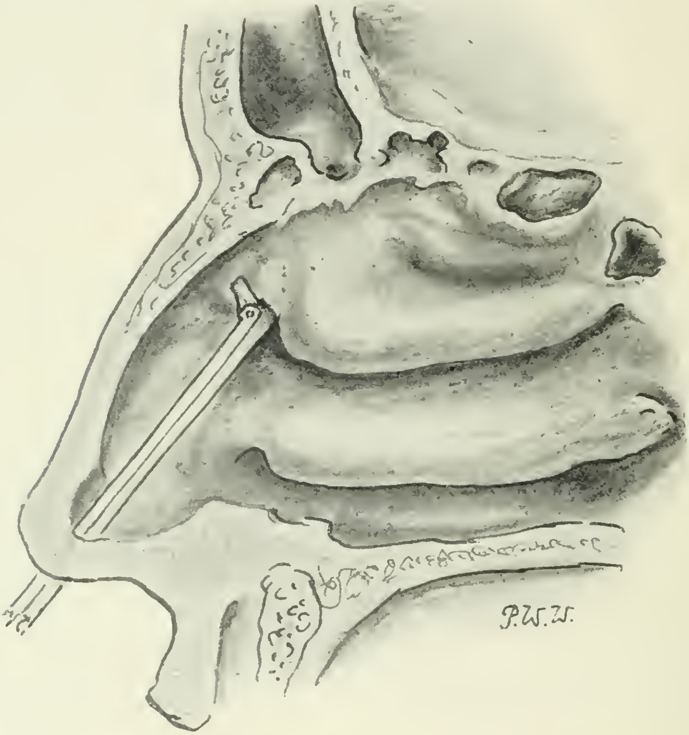
Mr. Howarth replied that at St. Thomas's Hospital it was the custom for these cases to be admitted under a general surgeon, and so this patient had his glands operated upon by one of his colleagues and then he was transferred to him (Mr. Howarth) for operation on the soft palate. He agreed that the glands on both sides should be dissected out, and he would suggest that this be done. He brought the case forward because tumours of the soft palate were of considerable rarity. He proposed to do the operation next morning.

Demonstration of the Exhibitor's Intranasal Frontal Sinus Instruments and Skiagrams showing Results.

By P. Watson-Williams, M.D.

The exhibitor showed instruments he used for intranasal frontal sinus operations—viz., the small angular forceps, curved cutting forceps for entering and enlarging the fronto-nasal passage, and the guarded frontal sinus burr; also skiagrams of patients, showing the very large bougies which passed into the frontal sinus after operation.

Drawings illustrating the method of operation were shown. He laid special stress on the method of entering the agger cells and fronto-ethmoidal cells without removing the anterior end of the middle turbinate, the small cutting forceps first cutting the anterior end of the attachment of the middle turbinal to the outer nasal wall in the manner he had described at the Liverpool meeting of the British Medical Association in 1912, and shown in the accompanying illustration.



The exhibitor's method of entering and opening up the fronto-ethmoidal cells.

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Laryngological Section.

February 6, 1914.

Dr. D. R. PATERSON, President of the Section, in the Chair.

Epidiascope Exhibition of Diagrams and Skiagrams illustrating the Intranasal Operations on the Lachrymal Sac.

By D. R. PATERSON, M.D.

THE PRESIDENT pointed out that the want of success in treating disease of the lachrymal apparatus by the nasal route hitherto was due to attention being devoted too exclusively to the tear-duct and its outlet. It is now generally recognized that epiphora, dacryocystitis, phlegmon and fistula of the sac are due to causes mainly affecting the sac itself or its outlet. Intranasal measures are therefore being directed higher up in the nasal cavity to a region which had been regarded as almost inaccessible. Slides were shown illustrating the anatomical relations of the tear-sac. Lodged in the lachrymal groove which is formed in its anterior half by the thick ascending process of the superior maxilla and in its posterior half by the thin sieve-like lachrymal bone, it has no osseous covering on its external aspect and can be palpated by the finger. Internally from the nasal side, the bony groove may present as a bulging—the torus lachrymalis—situated just in front of the point of attachment of the anterior end of the middle turbinate, or may be covered by a forward extension of the turbinate itself or by one of the ethmoidal cells. The operation of intranasal dacryocystotomy, developed by West and by Polyak, aims at exposing the internal wall of the sac and making a large opening in it so as to secure free drainage into the nose. It is done under a local anæsthetic. As the sac is found just in front of the anterior end of the middle turbinate, West forms, anterior to that, a quadrilateral flap of mucous membrane and periosteum which is left attached below and turned down. This gives increased access to the internal aspect of the lachrymal groove which lies immediately behind. The mucous membrane over it is removed and when the bony wall is exposed its anterior part is chiselled away and the thin posterior part removed by forceps. The exposed wall of the tear-sac is now seized with forceps and a piece cut out. A probe can be passed into the sac and its position ascertained by palpating externally. The flap is replaced and held in position by some packing which is removed in twenty-four hours. If the sac is overlapped by an ethmoid cell, or the turbinate comes far forwards, it can be readily cut away. Where a deviation of the upper part of the septum contracts the field, a limited resection will give the desired room. The operation is not difficult to perform and its results are excellent.

Slides were shown illustrating the external operation, dacryocystorhinostomy, suggested by Toti, an Italian rhinologist, and known by his name, which is carried out by an incision around the inner canthus and the sac detached and pushed forwards and outwards so as to give room for an opening to be made through the bony groove into the nose. After part of the sac wall, corresponding to the bony opening, is removed, the sac is replaced and drainage established into the nose as in the intranasal route.

It was considered that the intranasal operation showed certain advantages over the external: (1) It enables one to deal at the same time with intranasal disease, which often accompanied diseases of the tear-sac; (2) it involves little or none of the disturbance of the sac wall necessary in the external; (3) it is more easily carried out in conditions of external phlegmon; and (4) it leaves no scar.

Double Intranasal Dacryocystotomy for Lachrymal Disease.

By D. R. Paterson, M.D.

Girl, aged 16. "Watering" of both eyes noticed for three years. She had been treated two years ago for atrophic rhinitis, which was still present. About five weeks before admission a phlegmon appeared over the left lachrymal sac with the formation of an abscess or fistula. On the right side there was a blenorrhœa of the sac, a quantity of thin pus being evacuated on pressure. West's operation of opening the sac from the interior of the nose was done on both sides. On the right, part of the sac wall was overlapped by an affected ethmoidal cell, which was opened up; on the left it was necessary to resect the upper part of the septum in order to get room. The result of the operation was immediate and the fistula closed.

The case illustrates (*a*) some conditions of the tear-sac brought about by stenosis—viz., blenorrhœa of the sac, dacryocystitis, phlegmon, and fistula, and their dependence often upon a nasal affection—e.g., of an anterior ethmoidal cell, which may be laid bare only by operation; (*b*) the intranasal conditions usually met with in the operation; (*c*) the advantages of the intranasal route to the lachrymal sac.

DISCUSSION.

Mr. HARMER congratulated the President on bringing the subject forward, as it was of great importance to the Section, particularly as it was generally recognized by ophthalmic surgeons that the ordinary excision of the sac from outside produced results which were far from satisfactory; indeed, many were complete failures. He saw a gentleman, aged 27, who had had epiphora since he was aged 15, following upon an injury. He had consulted ophthalmic surgeons in different parts of the world, and had spent £2,400 on operations of various kinds, but none of them had done good. In this country he did not think there had been enough experience to know what the results of the intranasal operations were. They were easy to perform. The first results were quite satisfactory.

Mr. HERBERT TILLEY asked what was the swelling in the right nostril; it appeared to be the anterior end of the middle turbinal. He had done the operation only once, and that was last week, so he could not say anything definite about results. It appeared to be easy when the ethmoidal cell had been got out of the way, with the finger externally on the lachrymal sac to prevent damage being done. In the case of a very narrow nose the operation might resolve itself into a difficult procedure.

Mr. DONELAN thought the difference of opinion as to the merits of the external and internal methods would be settled by a more careful selection of cases for each mode of operating. It seemed to him that those in which the obstruction was very high up in the lachrymal canal, or which were of purely ocular origin, would be better treated by the external operation, which had, moreover, the advantage of not opening healthy ethmoidal cells. On the other hand, in cases due to intranasal disease the internal method would be found preferable. The countrymen of Toti appeared to be as much exercised by this question as we were here, and the January issue of the *Italian Archives of Otology*[1] had a very good paper by Professor Ferreri on the whole subject, favouring, however, the external route. Dr. Donelan thought it was Strazza who first performed and described the operation now known as West's, in the same year, 1904, as Toti published his external method.[1] The term "torus" was, he thought, first applied by Kopsche to the swelling formed within the nose by the lachrymal apparatus.

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[1] *Arch. Ital. di Otol.*, Torino, 1914, xxv, pp. 18-28 (with bibliography).

Mr. HOWARTH said that he agreed with Mr. Harmer that this was an operation that they would all have to perform: he thought that the cases which would probably come under their notice would not be simple stenosis cases, but those of purulent dacryocystitis, where the suppuration was being kept up by a diseased ethmoidal cell. His experience was limited to two cases in which excision of the lachrymal sac had failed to cure the condition. He did West's operation, but could not say that he found it particularly easy, as the ascending process of the superior maxilla appeared to overhang the duct and made the approach difficult. This operation was satisfactory in that it enabled the surgeon to deal effectively with those anterior ethmoidal cells which lie in front of the hiatus semilunaris and abut on the lachrymal duct. It was as yet early to say what the results were likely to be.

Dr. JOBSON HORNE foresaw that at no distant date a large number of cases of dacryocystotomy, and of new instruments for the performance of the operation, would be brought under their notice. He expressed the hope that an operation which promised to be beneficial in suitable cases would not be brought into ridicule and discredit by eagerness out-running discretion; and that they would hear more of the contra-indications and of the difficulties in performing the operation.

Dr. DAN MCKENZIE showed a case in which the operation was done eighteen months ago. It was shown before the Section last year. He had not seen it for eight months and one could not now see any signs of the operation wound in the nose. The patient was quite cured. Onódi had recently published a book on the "lachrymal sac and duct" which gave an excellent description of the anatomy of the region as well as an account of the intranasal surgical measures which had been proposed and carried out.

Mr. E. D. DAVIS said the ophthalmic surgeon at Charing Cross Hospital had promised to send on some of these cases. On the cadaver the operation did not seem to him difficult. One patient, however, had a very deep middle meatus and an overhanging nasal process, and that was a very difficult operation. Ten cases had been recorded by Mr. Leighton Davies, ophthalmic surgeon at Cardiff, in which Toti's operation was done, and in seven there were very good results. Cohn, of Charlottenburg, did the intranasal operation seventeen times, but he did not give his results.

The PRESIDENT, (Dr. D. R. Paterson) said the question of slitting the canaliculus to introduce a probe was a point of controversy between Polyak and West. West usually slit the punctum and introduced a stile, and that made it easier. Polyak held that the suction action of the punctum was thereby interfered with, and it was not desirable to do that more than could be helped. In his own cases he (the President) had not touched the punctum, except to syringe through afterwards. As Mr. Tilley said, one could easily feel the probe in the sac from the outside; one could also easily measure by one's eye, and determine the position of the sac. In answer to Dr. Donelan, he did not enter into the history of the operation; but, as he pointed out, the first to do the operation was Strazza, of Genoa, who did it in 1904, though he had not done any since. West had done 130 cases, with a very large percentage (90) of what may be regarded as cures. The latest figures from Polyak were forty-two operations. West had a very favourable opportunity, from the fact that Professor Silex, who had a very large eye clinic in Berlin, handed over every case of the kind to him, Professor Silex believing, from his large experience as an ophthalmologist, that more could be done for lachrymal sac disease by approaching it from the nasal side. He thought that attitude would be taken generally, when sufficient experience of the lasting results of the operation had been gained, for it was not difficult to carry out, and its success was striking.

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[1] *Clin. mod.*, Pisa, 1904, x, p. 385.

Resection of the Pharynx for Carcinoma.

By E. B. Waggett, M.B.

Woman, aged 47. Operation in February, 1913. The flap was cut with the intention of removing the larynx with the pharynx; consequently no skin was available for a plastic operation. The whole of the hypopharynx was removed with the exception of a strip of the right lateral wall ½ in. broad.

Case shown to illustrate: (*a*) spontaneous adaptability of the parts; (*b*) absence of cicatricial stricture; (*c*) functional recovery of the left arytænoideus posticus muscle.

Resection of Larynx and Pharynx.

By E. B. Waggett, M.B.

Debilitated man, aged 65. Extensive carcinoma of pharynx, laryngeal vestibule and tongue, commencing in left pyriform fossa. Palliative measures dictated by dyspnœa and very severe dysphagia. At the patient's request a radical operation was performed in November. A strip of the right pharyngeal wall, ½ in. broad, was retained.

The case illustrates the spontaneous adaptability of the parts still in process of healing. Facial palsy was produced by a very extensive gland operation with resection of the sternomastoid.

DISCUSSION.

Sir FELIX SEMON heartily congratulated Mr. Waggett on the success in his first case, not only because it was a brilliant case—on which also the patient must be congratulated—but because it represented the victory of a principle—namely, of the triumph of the early diagnosis in these extrinsic cases, which so far had been so sadly wanting. He had never been much enamoured of the operation for total extirpation of the larynx, though he admitted that it could not be helped in some cases. But henceforth, just as in intrinsic cases the ground had been cleared for thyrotomy by early diagnosis, thus it should be the endeavour of every laryngologist to diagnose also extrinsic cases so early that, as shown by Mr. Waggett's case, it was no longer necessary to remove the whole larynx. He hoped the Section would continue in Mr. Waggett's footsteps.

Mr. WHALE said that Mr. Waggett's first case looked so clean inside the mouth that nothing seemed to have been done; there was only a flat scar. Could he tell the Section more about the technique?

The PRESIDENT also commended the excellence of the results in these two cases. Laryngologists in this country were, perhaps, not hopeful enough of such cases. Three or four months ago he saw some excellent results in Professor Gluck's clinic. The remarkable operation results, where the mortality from these extrinsic operations was reduced to almost nothing, depended on the wonderful technique which had been elaborated, and which was well worth the attention of laryngologists here.

Mr. WAGGETT replied that these two cases were at the extreme poles of the class of case to which they belonged. In one there was early diagnosis, thanks to the direct method; the other he had watched dying for six or eight months, and finally, *ad misericordiam*, he had removed the larynx at his request. He was not proud of the technique in the first case. The operation was started as an extirpation of the larynx, but, finding the larynx could be retained, he did the best he could under the circumstances, there being no skin-flaps available. He brought the case forward as an encouragement to others who, like himself, had not the chance to make flaps, in order to show that Nature sometimes did all that was required. The woman seemed bound to have an almost complete stricture of the pharynx, but the event proved otherwise, and she now swallowed ordinary solid food, and did so better day by day; and twelve months had elapsed since the operation. Whether this happy circumstance was due to the nasal tube having been kept from the nose to the stomach for six weeks, he could not say, but the presence of a foreign body prevented close cicatrization of the parts, and enabled the strip of mucous membrane, ½ in. broad, left in the right fornix, to cover the raw surface. Now a bougie the size of the little finger could be passed through the stricture.

Advanced Gummatous Laryngitis in a Woman, aged 33, giving an obvious Luetic History and showing Gummatous Scars on Arms.

By G. H. L. WHALE, F.R.C.S.

WHEN first seen by the exhibitor, one month ago, the infiltration of epiglottis, ventricular bands, and arytænoids quite obscured the rima. Through a Killian's spatula he removed a piece of each arytænoid. In a pathological report Dr. Perkins stated : "A granuloma with no giant cell systems ; Wassermann's test positive." On January 13 Mr. Whale gave her 0·9 gr. of "914" intravenously. Marked local, but no general, reaction. One week later the lesion was obviously clearing, both cords were visible. Specimens were shown.

DISCUSSION.

Dr. DONELAN asked what portion of the arytænoid was removed.

Dr JOBSON HORNE inquired why Mr. Whale had "removed a piece of each arytænoid from the larynx of a woman, giving," as stated in notes, "an obvious luetic history and showing gummatous scars on arms." If for diagnostic purposes, then, Dr. Horne considered, the moderate method of clinching the diagnosis by the Wassermann test, as was done, would have been in every way sufficient and more satisfactory. If for the relief of urgent dyspnœa and dysphagia, of which there had been no mention in the notes, then tracheotomy would have been the better course of treatment. He felt sure that most of his listeners had frequently seen similar and worse cases rapidly clear up under iodide of potassium and mercury and without any surgical intervention. Personally, he could see no ground for removing a piece from either arytænoid in this case, nor could he conceive any laryngeal condition in which it would be desirable to remove a piece from both arytænoids. For some years past the whole progress of laryngology had been along the lines of the conservation of the larynx.

Mr. WHALE replied that it was difficult to say from what part of the arytænoid he took the piece, as the arytænoid was a shapeless mass. He believed it was from the inner aspect of the arytænoid, just behind the processus vocalis. It was done under direct vision, so that damage was impossible. The piece which had been removed was now exhibited, and did not measure more than 2 mm. across. With regard to iodide being sufficient, some liked to use modern methods, so he gave the patient salvarsan, and the case was doing very well. The case was sent to him by a dermatologist as being tubercle; she still had a brawny hard patch in the neck, and it was called scrofuloderma. The laryngeal appearances suggested a post-cricoid growth, with œdema all over it; he punched a piece out to exclude neoplasm, and had a Wassermann reaction done to exclude syphilis; it was positive, what was called "double positive." The scrofuloderma had now cleared up. It was one's duty to exclude everything possible if one was not sure.

Case of Sphenoidal Sinus, after Operation, showing Good Drainage.

By G. H. L. WHALE, F.R.C.S.

FEMALE, aged 51. Was operated on five months ago. Concentric closure of the sinus mouth by mucosa, which so often gave a disappointing result in these cases, had not occurred. The other sphenoidal sinus was not at present accessible, owing to a deflection of the septum; and, clinically, headache had disappeared from the operated side of the head, but not from the other side.

Case of (?) Lupus of the Nose.

By G. H. L. WHALE, F.R.C.S.

MALE, aged 12. There was much heaping-up of granulomatous mass on columella. The disease extended on to outer wall of left vestibule. Duration of disease, one year with intermissions.

The case was shown for diagnosis, because the angry red appearance of the mass, and the absence of apple-jelly areas, had led several surgeons to diagnose a streptococcal infection.

Inflammatory Fixation of the Left Arytænoid following supposed Impaction of a Foreign Body in the Larynx.

By George Wilkinson, F.R.C.S.

The man, aged 68, was seen first on the evening of October 21, 1913. About seven hours earlier in the day, whilst eating some "hash," he choked and felt a piece of meat stick in the throat. He made violent expulsive efforts and attempted to dislodge the obstruction by repeatedly passing his finger down his throat. He "could get hold of something, though he could not get it up." On examination great difficulty was experienced in obtaining a view of the larynx, owing to the patient "gagging." After cocainization a view was obtained by direct laryngoscopy. The epiglottis, arytænoids, and aryepiglottic folds were inflamed and much swollen, the swelling being more considerable on the left than on the right side. On the posterior surface of the epiglottis was a plaque of fibrin, which was readily removed by the forceps. The underlying surface was excoriated. Severe pricking pain on swallowing persisted for some days. The voice remains weak and husky. Swelling still remains, chiefly of the left ventricular band. The left arytænoid is displaced outwards and somewhat forwards, and does not move perceptibly on phonation, though there is some adduction of the left vocal cord. Nothing abnormal was seen on the X-ray screen. An examination was made by direct laryngoscopy on December 16 under general anæsthesia. No foreign body was detected.

Foreign Body (a Piece of Bookbinding Wire) removed under Direct Laryngoscopy, after having been Impacted in the Larynx Four Months.

By George Wilkinson, F.R.C.S.

The patient, a boy, aged 3, was sent to me at the Sheffield Royal Hospital, on October 30, 1913, by the Medical Officer of the Fever Hospital of a neighbouring urban district. The child had been admitted to the Fever Hospital on July 6, notified as diphtheria, with laryngeal obstruction which had begun four days previously. Antitoxin had been given. A tracheotomy was done. Subsequent examination of swabbings from the throat showed absence of Klebs-Löffler bacillus. The tube was removed, and had to be replaced several times. Early in October an abscess appears to have formed within the larynx, and to have burst with free discharge of pus through the tracheotomy wound. At this time there was great dyspnœa, in spite of the presence of the tube. Finally he was transferred to the Sheffield Royal Hospital. The tracheotomy wound had now healed, but there was decided laryngeal stridor, croupy cough, and husky voice.

Examination by direct laryngoscopy immediately revealed a bright band below the left vocal cord, lying antero-posteriorly, visible during inspiration. It looked like a pin. It was grasped by the forceps, and readily removed after the point had been disengaged from the mucous membrane below the anterior commissure in which it was embedded. It was found to be a piece of bookbinding wire, bent into the form of the letter Z. All symptoms disappeared next day.

DISCUSSION.

The PRESIDENT said these cases illustrated the damage sometimes done by foreign bodies. Some years ago he recorded an instance of an infant, aged 9 months, which had a collar-stud impacted in the larynx, where it remained three months. The child had a choking fit at the time, and then the parents forgot about it. Three months later the infant began to crow, and when seen at the hospital it had definite stridor. Examination by the direct method revealed the body impacted in the larynx.

Dr. H. J. DAVIS said he thought the first case looked rather like malignant disease of the larynx. There was more infiltration and fixation than trauma from a foreign body usually produced. With regard to "getting hold of something which could not be brought up," it was easy for a person to catch hold of his own hyoid bone and try to pull it out, and this was sometimes done. He knew of the case of a nun who, some twenty years ago, was brought up to a casualty department with the history of a rabbit bone impacted in the throat. An enthusiastic dresser said he could feel the bone with his finger, and, seizing a large pair of old Mackenzie forceps, pulled out the end of the great cornu of the hyoid bone with the muscles attached.

Mr. HERBERT TILLEY thought the possibility of malignant disease should be borne in mind. The possibility of a foreign body had also occurred to him, but he felt sure that Mr. Wilkinson would have satisfactorily excluded this factor.

Sir FELIX SEMON said he could bear witness to the fact that the disturbance produced by a foreign body could result in lasting ankylosis of the arytænoid cartilage. He remembered two cases, both of which he had described. In the first case a boy got a pin which was driven, through a swallowing movement, through the aryepiglottic fold, close to the artyænoid cartilage, so that the point of the pin was in the œsophagus. In those days, at St. Thomas's Hospital, cases for the Laryngological Department were not selected by laryngologists, but by a casualty surgeon. A casualty surgeon sent the case up to the surgeon in charge, and the latter, instead of transferring the patient to the Laryngological Department, proceeded to put his finger into the patient's throat to ascertain the situation of the pin. But when he wanted to withdraw his finger, it got caught by the point of the pin, and the more he tried to withdraw it the more he was pricked. Ultimately the patient was sent to the Throat Department, where the pin was easily visible and was removed. There remained, however, lasting ankylosis of the arytænoid articulation. The second case was one of impaction of a walnut-shell in the larynx, which set up so much swelling and irritation that, if there had not been a definite history of a foreign body, the laryngoscopic appearance would certainly have been regarded as characteristic of malignant disease. It was removed by external operation, but in that case also there remained lasting ankylosis of the crico-arytænoid articulation.

Mr. WILKINSON, in reply, said, with reference to his first case, that it was a fear that the infiltration of the larynx might be malignant, which induced him to subject the man to a general anæsthetic and direct inspection of the larynx. This was over a month ago, and at that time the left arytænoid overhung the glottis so much that he could not get any view of the interior of the larynx by indirect inspection. Since then the swelling had gone down very much, and the mobility of the arytænoid cartilage had definitely increased. That seemed to be against malignancy. By direct inspection he could find no sign of malignant growth on the surface of the larynx. He asked Mr. Davis whether he had seen anything within the larynx, other than the infiltration of the left ventricular band, which led him to think there might be malignancy. There was no evidence of any foreign body having ever got into the larynx, though it is clear that he had some choking during eating. His own idea was that the damage might have been caused by the man's finger-nail. He saw the case seven hours after the choking attack, and the man was still in great distress, and was working away at his throat with his finger. The larynx was very red and swollen, and that swelling remained without much change for over two months. Was it possible for a man to scratch the inside of his own larynx with his finger-nail? The marks at the back of the epiglottis seen at the first examination looked very much like scratches.

Case of Orbital Cellulitis due to Ethmoidal and Frontal Sinus Disease.

By H. A. Kisch, F.R.C.S.

C. B., aged 14, sent from the Western Ophthalmic Hospital suffering from orbital cellulitis. An abscess had formed two months previously above the left eyelid, and had burst, leaving a fistula, the orifice of which was situated just above the upper eyelid and about half-way out. A probe inserted through this fistula passed into a cavity which was found to contain pus. On examining the nose pus was seen under the middle turbinal, and there was extensive ethmoidal disease. On December 16, 1913, an operation was performed. The fistula was found to lead into an ethmoidal cell, and the frontal sinus was full of pus. The complete Killian operation was performed, and the patient rapidly recovered.

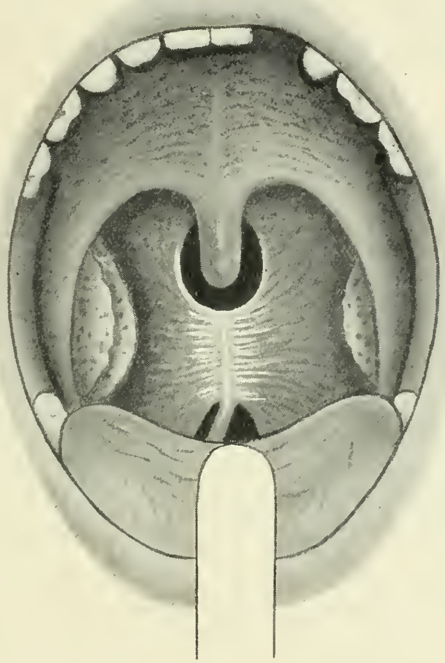
Extensive, Cicatricial, Pharyngeal Diaphragm following Scarlatina.

By J. F. O'Malley, F.R.C.S.

J. C., a boy, aged 5, had scarlatina two years ago and was then for about three months in a fever hospital. He could speak distinctly before his attack of fever, but on returning from the hospital it was noticed that he "spoke through his nose," and the condition has become worse since then. He can swallow solids and liquids without difficulty, and there is no history of interference with breathing. He has bilateral, chronic middle-ear suppuration, which has persisted since the attack of fever. Both membrani tympani are destroyed and there is pus and granulation tissue in the middle-ear cavities.

On examination of the throat one sees a diaphragm, appearing as a continuation downwards of the soft palate and formed by the union of the free edges of the two posterior pillars. It shuts off the naso- from the oro- and hypo-pharynx and is complete except at the centre of its upper and lower borders. The upper opening is a small space surrounding the normal uvula, in which the latter is free to move. At the lower border there are two openings, one on each side of a central adhesion, which passes obliquely downwards and backwards to the right and is attached to the posterior wall of the pharynx, opposite the level of the epiglottis.

The anterior pillars, at their upper ends, blend with the new diaphragm, whilst the lower ends are normal and behind the latter, on the anterior aspect of the new formation, the tonsils can be seen appearing rather superficial owing to the partial obliteration of the sinus tonsillaris.



Post-scarlatinal, pharyngeal diaphragm.

DISCUSSION.

The **President** said he supposed Mr. O'Malley would be able to pass a probe behind right away down, as there did not seem to be attachment to the posterior wall of pharynx, except at the lower border.

Dr. **Donelan** would like to ask Mr. O'Malley if he had any theory as to the mode of production of the peculiar deformity in this case. He thought it would be easily dealt with by simple division and suturing over the cut edges.

Mr. **Harmer** said that the difficulty was that the adhesion was likely to form again after a cutting operation. He suggested that recurrence would be less likely if division were made by diathermy.

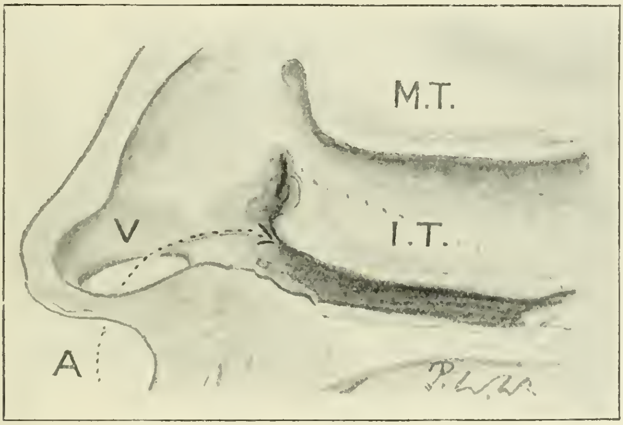
Mr. O'Malley replied that he had been puzzled as to what to do, because if one cut down the middle line there was merely connective tissue substance, having no contractile power, and with inspiration or suction of air it would be quickly drawn against the nasopharynx and adhere again. He believed the method of formation of these adhesions was as follows: There was an intense inflammation with inflammatory infiltration, and at the same time a myositis which put the muscular tissue in a condition of paresis. The swelling and infiltration, especially in the young child, facilitated the coming together of the parts, and the intensity of the myositis prevented the mobility which would otherwise exist and enable the parts to come away from each other. A denudation of epithelium proceeded at the same time, owing to the severity of the inflammation, and that facilitated the joining up.

Demonstration of the Exhibitor's Method of Intranasal Operation for Antral Sinus Suppuration.

By P. Watson-Williams, M.D.

The essential feature of the operation is the removal of the *anterior end of antromeatal wall below the line of attachment of the inferior turbinal and for a short distance above it*, as well as of the inferior antromeatal wall, as far back as may seem desirable and quite down to the level of the floor of the nasal fossa. An aperture having been made in the antromeatal wall beneath the inferior turbinal, it is extended backwards as far as is deemed necessary, and forwards to the extreme anterior limit of the inner wall by the use of the strong backward-cutting forceps. The latter are further used to cut the inner wall upwards in front of the anterior end of the inferior turbinal, if possible, though in some patients the antrum is not sufficiently developed forwards to avoid cutting just the anterior extremity of the turbinal. But in all cases the anterior portion of the inner antral wall is removed, so that a finger passed in through the naris along the outer wall glides without interruption along the posterior face of the anterior antral wall, and can palpate the antral lining mucosa right back to the posterior wall. It is not desirable to remove any part of the anterior antral wall, as the anterior dental nerve filaments are likely to be permanently injured in doing so, and the corresponding teeth supplied then remain insensitive. The lower part of the antromeatal wall is then removed by angular forceps cutting downwards, and as at the level of the floor of the nasal passage this wall is often $\frac{3}{16}$ in. thick, the forceps have to be strong. The same forceps are used to clip off any masses of polypoid mucous membrane of the antrum, unless for any reason it is considered better to curette away the mucous membrane entirely. The advantage of using these forceps is that they glide over healthy or non-œdematous mucous membrane, while polypoid thickenings are grasped and removed. Finally, the inferior turbinal is pressed outwards, fracturing the turbinate bone near its base, so as to make the turbinal as far as possible replace the removed portion of the antromeatal wall. Thus usually the advantages obtained are:—

(1) That the anterior third of the inferior turbinal body need not be removed, except in rare and exceptional circumstances.



The intranasal operation as described, showing the extreme anterior portion of the antromeatal wall removed.

(2) That the patient can more readily blow out the antral secretions.

(3) That access is obtained to the whole of the antral mucosa either by palpation or inspection, and therefore permits of an accurate estimation of the pathological condition of the mucosa and of the existence or absence of polypoid changes.

(4) That the mucous membrane can be curetted if that seems to be called for, and the cavity packed through the nares.

DISCUSSION.

The PRESIDENT asked if the exhibitor made a point of taking away the anterior ridge of the inner wall of the antrum. In the case of any secretion in the antrum, and the patient bending down, might not the secretion tend to fall out? He remembered once it was a serious inconvenience, for a patient had some watery secretion from the antrum for some time, and when she bent down at meal-times it often fell out.

Dr. WATSON-WILLIAMS replied that one of the advantages of doing the operation in the way he advocated was that the patient was able to blow his nose clear of secretion in the antrum. The current of air entered the antrum, swished round the corner and took everything out. But if he found a ridge of the anterior part of the inferior meatal wall left, the pocket retained the secretions and the patient was more likely to have his antrum constantly sodden. In only a small proportion of cases was the antrum undeveloped as the President mentioned. In the large preponderance of cases in adults the antrum developed forwards, so that one could bring the opening slightly in front of the end of the inferior turbinal. When the antrum was small, that could not be done. The intranasal operation in such cases gave good results and was not more difficult, only it did not bring the aperture forward in the way shown in the specimen.

(?) New Growth of Ventricle of Larynx.

By C. I. GRAHAM, F.R.C.S.

FEMALE, aged 47. Hoarseness and cough for three or four months. A small portion of the growth has been removed for microscopical examination. There was a smooth sessile swelling in the anterior part of left ventricle, obscuring the anterior third of corresponding vocal cord. The overlying mucous membrane was paler than that of the larynx generally. The colour and movement of the cords are normal. There are no palpable glands in the neck, and Wassermann's reaction is negative.

DISCUSSION.

Dr. JOBSON HORNE referred to a paper which he read at the meeting of the British Medical Association at Brighton last year on "Tumours of the Ventricle of the Larynx." In that paper he had described a hyperplasia of the ventricular band which he had observed years ago in the post-mortem room and also clinically, and which simulated a tumour of the band. He regarded the case before them as one of innocent hyperplasia of the kind he had described.

Mr. GRAHAM said that the histological section showed that the tissue was practically normal; and the case was therefore, in all probability, one of hyperplasia of the laryngeal ventricular band.

Case of Double Ogston's Operation performed for Chronic Frontal Sinus Disease.

By W. STUART LOW, F.R.C.S.

THE exhibitor considers that the success in this case and the absence of blemish are to be attributed to the method adopted—viz., by commencing the incision under the eyebrow, gradually sloping upwards, and then stretching the tissues upwards; the periosteum was divided high up and stretched downwards. When the wound is stitched up these displaced tissues return to their original position, so that a valve-like wound results, the one flap overlapping the other obliquely. The wound is protected from bandage pressure by means of a specially shaped cage which, having rubber-covered edges, acts like a Bier's band in facilitating rapid union—it also allows of free exudation of fluid between the edges of the wound. This method of incision and of carefully preserving and replacing in position the periosteum has been followed by marked restitution of bone, and is one of the advantages gained, another being diminution of deformity by preventing collapse of the anterior sinus wall. The patient was operated upon last July, fourteen days intervening between the two operations. He had had a great deal of treatment at various hospitals, and both nasal cavities were full of mucous polypi. The frontal sinuses were large and also packed with polypi.

The exhibitor greatly favours the Ogston operation in preference to the Killian, and he exhibited the case, which was a very severe one of its kind, as an example of many more treated similarly with success by the Ogston method.

Case of Double Paralysis of the Superior Laryngeal Nerves in a Man, aged 26, in the Course of Disseminated Sclerosis from Lead Poisoning.[1]

By JAMES DONELAN, M.B.

As the history of this case has been fully given already in the *Proceedings* it has been suggested that, in view of the great rarity of reported cases, it may be well to call attention here only to the laryngeal symptoms.

Owing to the advancing nerve degeneration, which now affects about equally both crico-thyroid muscles, on phonation the anterior end of the glottis is now no longer turned obliquely to the right, the side first affected, from overaction of the still comparatively unimpaired muscle of the opposite side. The interior of the larynx is now somewhat more difficult to see owing to increasing paralysis of the tongue and epiglottic muscles. The bending forwards of the arytænoid cartilages is also more marked. On phonation with gentle expiration the classical wavy outline of the glottis can be well seen, but this is lost if the air-stream is forced and the elliptical glottis is formed. With stronger expiration the cords are blown upwards and flap in the air-current. The patient can sustain a low, rough note fairly well, but it is impossible for him to raise the pitch more than one or two tones, and then he cannot sustain the note. Careful palpation shows that the distance between the thyroid and cricoid cartilages is not diminished perceptibly on phonation. Owing to the paralysis of the pharynx, tongue, and epiglottis, the patient is often troubled by the entrance of solid and liquid food into the larynx.

DISCUSSION.

Dr. JOBSON HORNE said there appeared to be good adduction and abduction of the cords, but the tension of the cords was impaired.

Sir FELIX SEMON said that in this case, if he had not heard Dr. Donelan's description that there was double superior laryngeal paralysis, he would not have seen it. To be frank, he saw nothing but a little relaxation of the vocal cords. Cases of genuine paralysis of the crico-thyroid muscles were extremely rare, but the wavy outlines of the vocal cords seen in them looked very different from what was at present visible in the case shown. In this case he could say nothing more than that there was some relaxation of the vocal cords.

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[1] Shown at the meeting of June 6, 1913; see *Proceedings*, 1913, vi, p. 180.

Dr. DONELAN regretted exceedingly that Sir Felix Semon was not present on one of the earlier occasions on which he had shown this case, or that he had not seen it earlier in the sitting, when the patient was less fatigued, and when the wavy line was more easily elicited. It seemed to depend a good deal on the power of controlling the expired air, so that the cords did not blow apart. He had now had the patient under observation for over eighteen months, and had had the rare good fortune of following the gradual development of the symptoms. He had seen no report of a case in which this had happened. He had not the slightest doubt as to this being one of double paralysis of the superior laryngeal nerves. If he had it would have been dissipated by the observations of two such excellent witnesses as Sir Felix Semon and Dr. William Hill, for slackness of the vocal cords and their almost complete disappearance under the lateral walls on inspiration were the two cardinal features of this rare disease, which had been described by nearly everyone who had published cases. He could not attribute any other diagnostic significance to these features in the present case, than that they showed the loss of crico-thyroid control over the other muscles. There appeared to be lately some failure of the transversus, which might be due to a partial innervation from the superior laryngeal nerves.

Double Abductor Paralysis in a Child, aged 8.

By C. W. M. HOPE, F.R.C.S.

D. V., AGED 8, was admitted to King's College Hospital on December 31, 1913, with marked dyspnœa.

Past history: No history of any recent previous illness or febrile attack. Up to fourteen days before admission was perfectly well: gradual onset of dyspnœa, but voice was not noticed to be altered.

When seen on January 1, 1914, the voice was good; but there was marked dyspnœa, sucking in of intercostal spaces, and supraclavicular regions; marked retraction of lower end of sternum, and slight cyanosis. Temperature normal; pulse 120. On examination by the direct method under chloroform both cords were found fully adducted, normal in colour, and no movement seen either of them or of the arytænoids, which were of normal size. Only a tiny area for aeration at posterior end of glottis. Intubation tried with O'Dwyer's tubes, but they were coughed out within a few minutes of introduction. Tracheotomy was then performed through the third and fourth rings of trachea. After four days tube was blocked by day and opened by night. Swab from larynx showed absence of Klebs-Loeffler bacilli.

January 23, 1914: Cords show some movement to-day; there is slight abduction and also some movement of the arytænoids.

Tracheotomy tube had been removed and left out on January 14, 1914, but owing to night stridor was replaced (low tracheotomy) on January 29, 1904.

Skiagram of chest shows no enlargement of thymus gland or any increase in size of bronchial glands.

The case is shown as one of extreme interest, no diagnosis having been arrived at as to the cause of the paralysis.

DISCUSSION.

Dr. LAMBERT LACK said at present he had a case in the London Hospital, of exactly the same nature, in a small child. Tracheotomy was done over two years ago. When the child was seen in the out-patient room the cords appeared to be normal, and the cause of the stridor and dyspnœa was not recognized. On passing a bronchoscope to ascertain the cause of the dyspnœa, directly the instrument entered the larynx the dyspnœa was relieved. On removing the bronchoscope again, it was seen that the cords remained in the middle line. Tracheotomy was performed, and after some months the tube was left out, as the cords seemed to move a little. But during the last week the child had come up again very ill and suffering from loss of weight; it was not half the size it should be for its age. Obviously, it had been suffering from deficient oxygenation for years. Now that the tube had been replaced, the child's development would probably go on. No cause could be discovered for the paralysis, and the condition appeared to be congenital. Some years ago he showed another case in a girl, aged 18, in whom no cause could be found for the paralysis, and in her also the history dated back almost to infancy.

Dr. PETERS said he had seen this condition exist to a modified degree with congenital deformation of the epiglottis, and he believed it was characteristic that the voice was not lost, and the paresis varied greatly.

Dr. H. J. DAVIS said that he thought both recurrent laryngeal nerves were being pressed upon by enlarged mediastinal glands, and he had recently had a case very similar in a child, aged 2, who died with left total recurrent paralysis, due to pressure of lymphomatous glands in the thorax. The child was sent to him as a case of foreign body in the lung. But he could not find any signs of it, and a further search next day was also unsuccessful. That was last July. The child got worse, developing bronchitis and paresis of the other cord. As soon as the bronchoscope was passed the child breathed easily. He did a tracheotomy, but three weeks later the child suddenly died. Post mortem, enlarged glands were found in the mediastinum, the left recurrent laryngeal nerve being implicated in the mass. The glands were lymphomatous, and there was no sign of tubercle. He would show the pathological specimen at a subsequent meeting, as it was a very beautiful preparation, showing an unusual condition.

Note of the Result of Treatment of an Unusual Case of Adductor Paresis.[1]

By E. D. Davis, F.R.C.S.

Acting on the suggestion kindly given by some of those members present who saw the case of a healthy gardener suffering from what was considered to be an intractable case of functional aphonia, the patient was anæsthetized on January 27 and the larynx thoroughly examined by suspension laryngoscopy and the bronchoscope. There was practically no movement of the vocal cords, which remained more or less hidden in complete abduction. The hypopharynx and trachea were normal. Stimulation by the intralaryngeal electrode, with the full strength of the battery, produced no effect beyond a slight movement of the epiglottis and posterior commissure, probably produced by contraction of the arytæno-epiglottidean folds. It is suggested that the case is one of paralytic contracture or atrophy of the laryngeal muscles. Intralaryngeal stimulation on recovery from the anæsthetic was unsuccessful.

DISCUSSION.

Sir Felix Semon wished to ask Mr. Davis what he meant by the words "It is suggested that the case is one of paralytic contracture or atrophy of the laryngeal muscles."

Mr. E. D. Davis, replying to Sir Felix Semon, said he feared the explanation asked for was very difficult to give. Mr. Waggett and he discussed the case thoroughly, and that was the only conclusion they could come to. They wished for a diagnosis. Dr. Gordon Holmes said the case could not be functional if there was paralytic contracture, but Dr. Holmes could not find organic disease. Five years ago, when he saw the patient, it was a case such as is described in the text-books as paralysis of the arytænoideus, with a chink in the posterior third of the glottis, forming a triangular interval. The cords moved well, but, on vocalization, only the anterior two-thirds of the cords came together. There was a chink at the back. He did not see the patient for five years, but he saw him repeatedly when he had arytænoideus paralysis. The man deserted the hospital, and then came up again five years later.

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[1] Shown at the last meeting of the Section held on January 9. See *Proceedings*, p. 66.

Sir FELIX SEMON said he only wished to make some observations on this case because he would be sorry for any loose expression such as he had quoted to go unchallenged into the *Proceedings*. He could not help asking: Why make any suggestion? There was no need for it in the present case. He thought everyone who had had experience would say it was a case of functional double paralysis of the adductors. It happened in a male, which was not an unheard of thing, and the cords stood very widely apart. Neither was that unheard of. If one read the older literature, that which was produced in the infancy of laryngology, one would find several cases described in which the glottis during quiet respiration was so widely open that it would admit a full-sized finger. Such cases had been described by Czermak and Solis Cohen. In his own paper on "Abductor Tonus," though that was published twenty-four years ago and perhaps had therefore no right to be quoted nowadays, one would find it stated that in quietly breathing people the width of the glottis amounted sometimes to 14 mm. when seen with the graduated mirror, which corresponded to 19 mm. actual width. If in such a case functional bilateral adductor paralysis occurred, as, he had no doubt, had occurred in this case, there was no need to seek refuge in a paralytic contracture, a hypothesis which, he was glad to hear, had already been combated by Dr. Gordon Holmes on general neurological grounds. It was sufficient to describe it as a double adductor paralysis in a man whose glottis, before he had anything the matter with him, was probably widely open in quiet respiration. The mere fact that this case had not yielded to treatment did not stamp it as an extra-ordinary one. Again he would revert to the older literature, in which one could read cases described by Sir Morell Mackenzie or any of the older writers, in which, while they succeeded almost universally in functional paralysis in restoring function by electricity, or hypnotic suggestion, or by cold water douche, or by central faradization, or methodical voice practice, or other methods, they freely admitted that there were always a few cases remaining in which practically no method was of avail. The present case seemed to be one of those, and he would not be surprised if, when the paresis had lasted ten years or more, one day, without apparent rhyme or reason, the voice were to return. Perhaps the oldest case on record was that described by Herodotus, in which the patient, the son of Crœsus, suddenly regained his voice when some one was about to slay his father, for he suddenly shouted, "Do not kill the king." That might have been a case of hysterical mutism, but anyhow it was under the influence of a strong emotion that the voice came back, and very likely the voice would come back to the present patient under some such stimulus.

Dr. LAMBERT LACK said he was much interested in what Sir Felix Semon had just said. The majority of functional aphonias recovered, but a few did not. Why was it that the cases which did not recover were those which showed paralysis of the arytænoideus? In his experience, it was those cases where there was a triangular opening between the posterior parts of the vocal cords which did not yield to treatment; in fact, that class of case produced all the failures. He thought that some of these cases were organic. There was one case in the Hospital in Golden Square during Sir Morell Mackenzie's time. The patient was attending for forty years, and at the end of that time the larynx gave exactly the same picture as when at first seen. He had since seen two or three others in his practice, and all had paralysis of the arytænoideus, that being apparently the only adductor affected. The case which Sir Felix Semon mentioned was one of functional mutism.

Sir FELIX SEMON rejoined that the case referred to by Dr. Lack was absolutely different from Mr. Davis's case. He remembered the case Dr. Lack spoke of. In Mr. Davis's case the glottis was open to the greatest possible width, and the vocal cords could scarcely be seen because they were lying close to the sides of the larynx, whilst the case mentioned by Dr. Lack was one of isolated paralysis of the interarytænoid muscle, possibly of peripheral neuritic or myopathic origin.

Paralysis of Right Vocal Cord.

By W. H. KELSON, M.D.

F. R., AGED 48, bus-driver. Hoarse six months. No history of syphilis. Nothing abnormal detected in chest. Larynx congested. Right vocal cord appears to be fixed in a position between adduction and full abduction. Right arytænoid and right ventricular band much swollen. Epiglottis not swollen, but overhanging.

Case of Pharyngeal Cyst.

By W. DOUGLAS HARMER, M.C.

THE patient, a man, aged 28, was first seen in 1904 with an inflammatory swelling over the right lower jaw, which was probably due to dental causes. This was incised in July and again in September, a piece of bone being removed from the jaw on the second occasion.

In 1907 he complained of pain in the right side of the throat and dysphagia; he was also slightly hoarse. Nothing abnormal was discovered.

In 1909 the symptoms had increased, and a lump was first noticed on the right side of the pharynx. On swallowing, the swelling was displaced outwards by contraction of the pharyngeal muscles. The larynx was also displaced to the left by a rounded tumour, which filled the pyriform fossa. On its upper margin, close to the right border of the epiglottis, there were three small white nodules. Enlarged veins were seen in the mucosa covering the tumour.

In November, 1909, an external incision was made by Mr. D'Arcy Power, and a thick-walled cyst was found in the wall of the pharynx and removed.

In 1910 the swelling reappeared, became suddenly painful and burst internally. The patient stated that he coughed up pus and was afterwards relieved.

Since then the size of the cyst has varied from time to time. It is now larger than usual, and projects into the cavity of the larynx. The nodules have also increased in size.

DISCUSSION.

The PRESIDENT said the case was a remarkable one; the cyst was of considerable size. Its site and the fact of its recurrence suggested a branchial origin. He asked what Mr. Harmer proposed to do with it.

Mr. HARMER replied that he thought it should be possible to dissect it away from the outside, and so remove the whole of it. Sir Henry Butlin saw the case some years ago, and at once remarked, "That is a congenital cyst: I have seen the condition before."

Case of Thyroglossal Fistula.

By DAN MCKENZIE, M.D.

THIS case was shown as illustrating two atypical features—namely, (1) the opening of the fistula above the hyoid bone, and (2) its situation well to one side of the middle line.

Laryngological Section.

March 6, 1914.

Dr. D. R. Paterson, President of the Section, in the Chair.

Pathological Specimens of Tonsils from a Case of Lymphatic Leukæmia.

By H. J. Davis, M.B.

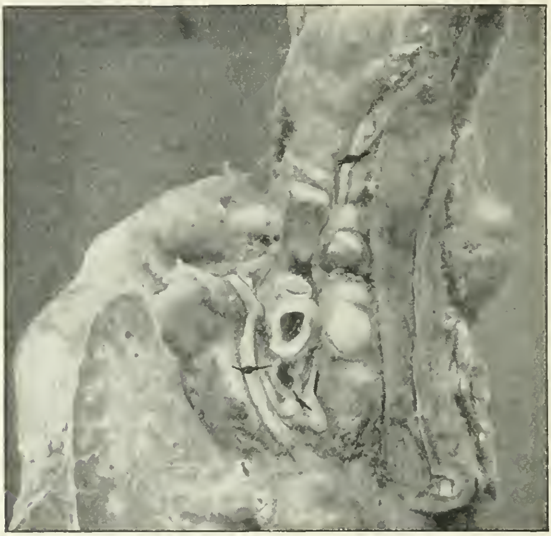
The specimens were suspended in Frost's solution: sodium fluoride 80 grm., chloral hydrate 80 grm., potassium acetate 100 grm., cane-sugar (Tate) 2,500 grm., saturated solution of thymol in water 8,000 c.c. The solution preserves the natural colour of the preparation and was used for that purpose. The specimens were taken from a boy, aged 7. The lymphomatous nodules in the gland substance were well seen.

Preparation showing the Left Recurrent Laryngeal Nerve involved in a Mass of Lymphomatous Glands.

By H. J. Davis, M.B.

The course of the nerve from the aortic arch to the larynx is indicated by loops of horsehair. Total recurrent paralysis was observed before death.

The case was of great interest and anxiety; it was that of a child, aged 2, who was admitted as a case of foreign body in the bronchus. There was dyspnœa, stridor, and collapse of the left lung. I examined the bronchial tree three times but failed to find any signs of a foreign body; nevertheless, I thought it might be there all the same, although repeated X-ray skiagrams gave a negative result. Later the left recurrent laryngeal became paralysed, left abductor paralysis, and later still, as the paralysis became complete, the left cord assumed the cadaveric position. This to my mind negatived a foreign body and indicated pressure on the recurrent nerve and left bronchus in the thorax. A low tracheotomy was performed. Not much relief was obtained, but the child lived three weeks afterwards and died suddenly. The preparation shows that the lung is collapsed, that the lumen of the bronchus is partially occluded by external gland pressure, and that the recurrent nerve is flattened, expanded, and inseparably united with a mass of glands on its upward course to the larynx.



Specimen taken from a child, aged 2, showing the left recurrent laryngeal nerve involved in a mass of lymphomatous glands.

Owing to the profuse secretion in the tubes and the always urgent condition of the child, bronchoscopy was never an easy matter, and I found a hint given to me by Mr. Tilley some years ago of great service. It is to pass a cotton-wool mop dipped in ether through the tube; this clears the passages of mucus as if by magic, and enables one to see; the only objection to it being the vapour or mist which is liable to remain in front of the line of vision, and which is difficult to dislodge.

In this case, as the left lung was collapsed and almost functionless, the mist "hung" in the left bronchial tubes for some time, whereas when the right bronchi were similarly dealt with the vapour was rapidly indrawn or expelled. This might almost be used as a test as to whether air was passing into a bronchial offshoot or not.

This is the youngest patient in whom I have observed left total recurrent paralysis.

I am indebted to Dr. Elworthy for enabling me to show the specimens.

DISCUSSION.

Sir FELIX SEMON said this case was one of very great interest; indeed, the specimen was a veritable museum of pathological curiosities. To begin with, it was surprising that recurrent laryngeal paralysis should be so seldom met with in children, bearing in mind the frequency of enlargement of the cervical and bronchial glands in children. Secondly, he was pleased that Dr. Davis had been able actually to observe in this case the transition from abductor paralysis to complete recurrent laryngeal paralysis. Though it was now many years ago that attention was called to this occurrence, the number of cases in which such a transition had been actually observed was still but small. The third point was, that in the case of this child unilateral laryngeal paralysis had given rise to dyspnœa. True, it was not a pure case; for there was—which was the fourth point of interest—a double stenosis: above, in the larynx the narrowing, due to the unilateral paralysis, and below, direct compression of the lower air passages, due to the pressure exerted by these lymphomatous glands on the trachea and left bronchus. That lower stenosis was the reason, also, why the tracheotomy which had been performed gave so little relief. Though it relieved the upper stenosis one could well see it could not have relieved the lower. This question of a double stenosis had been discussed only recently in the Section. Perhaps the most interesting feature about the case was that even unilateral paralysis in a child might produce dyspnœa. There were very few cases of this on record. Many years ago (1884) he had attempted a collective investigation concerning this point in the *Internationales Centralblatt für Laryngologie*, but the replies he received were unsatisfactory. The whole question was interesting, because it bore on the observations made fully one hundred years ago by Legallois, showing the enormous difference in the calibre of the larynx in young animals compared with that of the adult. Legallois performed experiments by cutting the recurrent laryngeal nerves in animals of different species, such as dogs, cats, and rabbits, within a few days of birth. Whilst there were considerable differences with regard to the species of the animals experimented upon, it might broadly be stated that very young animals perished in periods ranging from a few hours to a few days, while when the same experiment was performed on adult animals there was some degree of dyspnœa, but not a very considerable amount. Similarly in human beings, an adult could easily bear an amount of narrowing of the larynx which in a child caused severe dyspnœa. This was well shown by Dr. Peters's case demonstrated at that day's meeting (*see* p. 119), in which there was complete abductor paralysis in an adult, yet no trace of dyspnœa. He thought the Section should feel very grateful to Dr. Davis for having brought this case forward.

Mr. HERBERT TILLEY explained that the method spoken of by Dr. Davis was hit upon by him by accident. He was once in a similar predicament to that described by Dr. Davis owing to the bubbling of mucus at the lower end of the tube. The bubbles were at once dispersed by a mop of wool moistened with ether, and thus he was enabled to see what he was looking for.

Dr. BRONNER asked whether these glands could be removed by operation. He saw a distressing case some years ago in which a boy died owing to first one bronchus and then the other being pressed on. All kinds of tubes were tried. Surgeons who were consulted said it was impossible to remove the glands. Was that possible by modern surgical methods?

Mr. WAGGETT quoted the case of a small child with tracheal compression by (presumably) tuberculous glands, verified by direct tracheoscopy. After a few months at Margate dyspnœa disappeared, and direct tracheoscopy showed a normal lumen.

Sir FELIX SEMON said he had once been associated with Lord Lister in a case of the kind mentioned by Mr. Waggett, the patient being the young daughter of a great Scotch physician. Lord Lister made many experiments on dead bodies to see if he could get down far enough to remove those glands. Ultimately they went to Brighton for the purpose of removing the glands, but they had meanwhile disappeared.

Sir STCLAIR THOMSON said he did not know whether this was the earliest case of recurrent laryngeal nerve paralysis in a child, but Mr. Hope showed a case at the last meeting of double abductor paralysis in a little girl, aged 8, and her stridor was so marked that tracheotomy was needed.[1] The cause had not yet been discovered. The small size of the larynx and trachea in children could scarcely be believed. When he was writing his text-book, he asked Mr. Fraser, of St. Mary's Hospital, to get him the larynx of a newly born infant. It was split longitudinally and hardened, and he said it was not shrunk. It was sent to the artist to make a drawing of it, and when the drawing came, he could hardly believe it was true to model. He had to get two or three specimens before he was sufficiently satisfied to put the illustration in the book, so narrow is the glottis of an infant.

The PRESIDENT (Dr. D. R. Paterson) said he mentioned a case at a former meeting, where there was a double cause of stenosis. When a bronchoscopy tube was passed beyond the paralysed cords very definite stenosis was found at the root of the trachea. In regard to the differences between the calibre of the human trachea and larynx and that of lower animals, there was an interesting paper by Némai, of Budapest, in which it is shown to be largely due to a change in the form of the arytænoid. In the lower animals this is a flat, concave, cartilaginous plate, which allows of great distension of the posterior part of the rima glottidis—the so-called cartilaginous glottis, which plays the most important part in inspiration, and permits the glottis a much wider air-way than in the human. On the other hand, the human voice, with the consequent great development of the larynx, has only been acquired at the expense of curtailing the air-way of its possessor.

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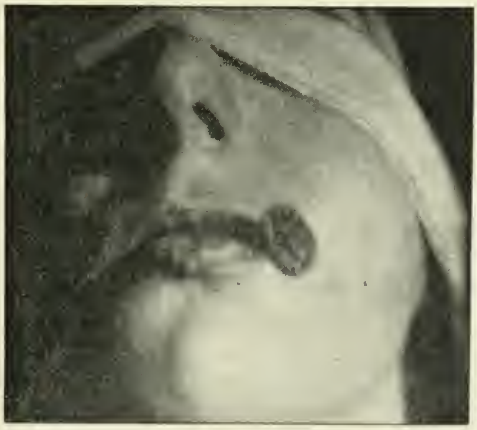
[1] *Proceedings*, p. 93.

Dr. H. J. DAVIS, in reply, said that it was in consequence of seeing Mr. Hope's case at the last meeting that he decided to show this. He expressed the view on Mr. Hope's case that it was one of double abductor paralysis, due to a condition such as was present in this case. It was really surprising how any tube could pass through a child's glottis, as it was so very small, but after passing the larynx it was easier to proceed. He expected to find a foreign body in the bronchus in this case, as the initial symptoms were so suggestive of it—stridor, dyspnœa, and collapse of the lung.

Photograph showing Two Primary Sores on the Lip and Angle of the Mouth.

By H. J. DAVIS, M.B.

THE patient was a girl, aged 22. The case was promptly treated with neo-salvarsan, and the usual severe symptoms met with in these cases were not observed. The photograph was taken by Dr. Morton.



Primary sores on the lip and angle of the mouth.

Case of Necrosis of the Palate.

By H. J. Davis, M.B.

The patient was a man, aged 70, who stated that he was kicked in the face by a pony when aged 10, and necrosis of the palate took place. He has worn an obturator ever since, and when this is removed a perfect view of the nasal fossæ and turbinal bones can be observed.

The President said he supposed it was congenital specific disease; it had been corrected in a remarkable way by the obturator.

Case of Abnormal Artery on Wall of Pharynx.

By H. J. Davis, M.B.

The patient was a man, aged 50. A large pulsating vessel is seen on the posterior wall of the pharynx—it appears too large for the ascending pharyngeal artery. On ordinary laryngoscopy the bifurcation of the trachea and both bronchi are seen with the greatest ease.

Mr. Harmer thought it was a complete coil in the internal carotid artery. Such a coil was frequently seen in the dissecting room. A few meetings ago he mentioned a case in which the house surgeon at a hospital mistook such a loop for adenoids, and removed it with forceps. There was a great gush of blood, and the patient collapsed. Three hours later, though the child was still on the table, the bleeding returned, and death occurred in ten seconds. Post mortem it was seen that the coil had been completely removed, so that the two ends of the artery were ½ in. from each other. On the other side there was a similar coil, which projected towards the pharynx.

Case of Destruction of Nasal Septum.

By H. J. Davis, M.B.

The patient was a woman, aged 45, who had lost the septum as well as the columella of the nose. When the face is raised the appearance to which this gives rise is peculiar. The symmetry and curves of the alæ nasi are well shown. It can be noted that loss of the bony and cartilaginous septum does not necessarily produce sinking in of the bridge of the nose. This has a bearing on the extent of the septal partition which can safely be removed in submucous resections without risk of external deformity. The external appearance of the nose in this patient is quite good, in spite of complete loss of intranasal support.

DISCUSSION.

The PRESIDENT said he had a case which came to him at an early stage. He looked easily into the nose as the septum and columella were gone, and there was no sinking, as in Dr. Davis's case. He thought some sinking would come on as a result of contraction after healing. This patient he spoke of was treated at once by salvarsan, which led to a rapid healing, but he was disappointed on account of the subsequent sinking, although in specific cases one could do nothing to prevent it.

Dr. DAN MCKENZIE agreed with Dr. Hill that the tip of the nose was held up by the mutual support of the lateral cartilages. Dr. Davis would not probably have one believe that as much of the septum could be removed in submucous resection without any risk of external deformity.

Dr. F. DE HAVILLAND HALL said the case reminded him of a disastrous one he had when he commenced throat work. A lady was sent to him from the country with commencing mischief in her nose. He made an examination, using cocaine so that he could obtain a good view. He wrote an unfavourable report to her doctor, advising energetic treatment. The course was rapid, and in a week the bridge of the nose had fallen in, so that her appearance resembled that of the present patient. The blame for that was laid upon him, for it was said he used a caustic application for the examination, and he never saw the patient again.

The PRESIDENT said he did not think there could be much doubt that the lateral cartilages were ample support for the bridge of the nose, so that one could remove practically the whole of the septum without any falling in. In this case, as in so many others, the contraction seemed to be taking place first of all just where the cartilage joins the bone.

Dr. H. J. DAVIS replied that he was surprised to see the change in the case, and he admitted that there was retraction now; he saw the patient last five weeks ago, and the condition then was as stated in the notes.

Case of Empyema of the Antrum with Infection of the Nose and Cheeks.

By H. J. Davis, M.B.

The patient was a woman, aged 30, with redness, infiltration, and œdema of the nose and both cheeks of six months' duration. I mistook the case for one of lupus erythematosus. There were shadows on trans-illumination, but this might have been accounted for by the extreme thickness of the infiltrated integuments. Dr. Pernet, who saw the case, disagreed with my diagnosis, and suggested an empyema of the antrum and a septic infection of the integuments therefrom. This, on intranasal puncture, proved to be the case. The condition is one of chronic symmetrical lymphangitis with blocking of the lymphatics from a septic focus in the antrum.

DISCUSSION.

The President said the case was interesting, as being the type usually described in text-books as antral disease, a form which was but rarely seen. One would almost discount antral disease in such cases, as Dr. Davis did, when it was first seen.

Mr. Hope asked whether Dr. Davis punctured the other antrum as well, because that looked the more unhealthy of the two.

Mr. Herbert Tilley referred to a case of solid œdema of the face, which was recorded[1] some years ago; in that case the man's eyes were almost closed by the œdema. He went to many hospitals, including his (the speaker's), and he tried to find a septic focus which might account for the lymphatic obstruction. The search was unsuccessful, but someone had opened the left frontal sinus without finding any disease there, and naturally the œdema did not disperse. The case seemed identical with the one shown to-day. He asked Mr. Sampson Handley to attempt draining the lymphatic vessels, but the patient was lost sight of.

Mr. O'Malley said he recently saw a similar case in a girl, aged 16. The history was that œdema began on the right side of the face, and spread from below; and later the left side of the face was involved. There was some excoriation round the anterior nares, which did not look healthy, and he believed it to be lymphatic obstruction due to sepsis. Nothing was found in the antrum, but a vaccine was made from the cultivation taken from the nose. The case, however, had not improved.

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[1] *Proc. Laryng. Soc. Lond.*, 1906-7, xiv, p. 26.

Dr. PETERS said the swelling was on the right side of the face, and there was also a fissure of the nose on that side, which was probably the origin of the absorption. In cases of obstruction of the lymphatics of the nose there was usually a history of fissure or of boil infection.

Dr. DAN MCKENZIE said he doubted the diagnosis altogether. When he examined the patient the œdema was most marked over the right cheek, whereas the pus was found in the left antrum. One had heard of similar cases, in which there was no focus of trouble found in the antrum. Was it not possible that the chronic lymphatic œdema in the face and the suppuration in the antrum might be due to one common cause? He would require more proof before accepting the view that the face œdema was secondary to antrum suppuration.

Dr. KELSON asked whether a Wassermann's test had been done. He had seen a similar case, which turned out to be syphilis. In that instance ionization had been proposed, but before commencing it a Wassermann test was done, and, being positive, the condition was treated and removed by iodide of potassium.

Dr. H. J. DAVIS replied that he punctured the other side also, but nothing came away. There was a marked shadow on both sides of the face, and he considered that was mainly due to the thickened integuments. When he first saw the case he thought it was one for the skin department, but Dr. Pernet said positively that it was not lupus erythematosus, and suggested empyema of the antrum. The skin was infected from the nose, from which there was a purulent discharge on one side. He did not see why this should not affect both sides of the face, as in this instance.

Malignant Disease of the Ethmoid extending along the Antral Roof and Perforating the Maxilla at the Outer Angle of the Orbit.

By H. J. DAVIS, M.B.

THE patient was a woman, aged 44. The case resembled one shown by Dr. Dan McKenzie at the November Meeting, 1913.[1] There was a large tumour over the malar bone with nasal polypi; on curetting these away the left ethmoid came away *en masse*. The disease was obviously malignant. The antrum was invaded, but the growth tracked along the upper antral wall, clinging to the bone and perforating the malar prominence. The lower parts of the antrum were not affected. A second more extensive operation was performed a week later, and so far there had been no recurrence. An X-ray plate by Dr. Morton showed the line of invasion. The outer angle of the antrum was seen to be eroded by the tumour.

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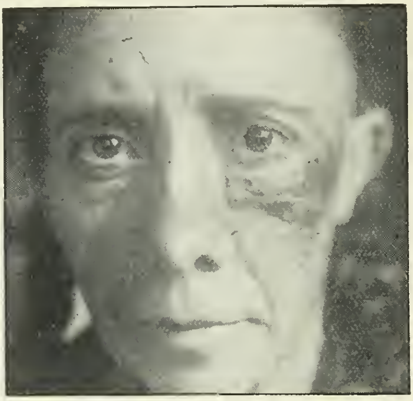
[1] *Proceedings*, p. 11.



Malignant disease of the ethmoid. Photograph (by Dr. Morton) after the second operation.

DISCUSSION.

The PRESIDENT said these cases raised a point of considerable importance—namely, as to the best method of getting access to the growth. He had used Denker's method of approaching it through the antrum, but that was not sufficient, as it did not take one high enough up. Moure's incision round the angle of the nose, on the other hand, gave plenty of room for it. He did one by that route a few days ago, and found that the tumour, which began in the inferior turbinate, involved a large part of the anterior ethmoid, spreading up and invading the floor of the frontal sinus; he did not know of that involvement until the operation revealed it. Another question was as to the best means of preventing blood flowing into the back of the throat. Like most men, he had used a posterior plug for ordinary cases; but his experience was that it had to be of large size, and it depressed the soft palate so much that there was interference with the air-way, causing difficulty with the anæsthetic. He had recently tried what was usually done in ordinary epistaxis—namely, plugging the particular nostril by a small plug attached by a string drawn through the anterior nares. The patient could make use of the unaffected nostril for breathing, which was a distinct advantage. It was not, however, suitable for all cases.

Sir StClair Thomson said he had recommended Moure's operation very frequently, but there were two points in these cases now shown which justified a further word. In one of them the lower part of the antrum was not affected, and the return of growth in the other was not in the antrum. He once made investigations in all the museums of London, and found that the antrum was the last place in the nose and accessory cavities where malignant growth originates. The tearing out of the alveolus, which the general surgeon had been doing, was futile. If Dr. Davis were to remove a little for microscopic examination he would find there was recurrence in the ethmoidal region. In malignant disease of the nose and accessory sinuses, nine out of ten originated in the ethmoidal region. Until people tried Moure's operation, they would scarcely believe how directly they could get down to the growth and follow it to the base of the skull. They could only know they had arrived at cure when they could show cases such as he showed on two occasions, in which the inside of the nose was lined with smooth cicatricial tissue. One of his patients was aged 70, and there had been no recurrence after over four years.

Mr. Waggett said, with regard to the incidence of disease in the palatal portion, there was a class in which malignant disease grew from the "rests" connected with the embryonic tooth organs. These burrowed in the substance of the palate. He had a case in which disease burrowed from one side to the other, and the entire palate had to be removed. He had seen sarcoma start in the floor of the antrum, but he thought it correct to say the majority of new growths started in the ethmoidal region. With regard to hæmorrhage, where this was likely to be dangerous he advocated crico-thyrotomy and a laryngeal plug.

Dr. Dan McKenzie asked whether Sir StClair Thomson, when referring to the common origin of malignant disease of the nose, included epithelioma as well as sarcoma. His own impression was that epitheliomata were more frequent from the superior maxilla and antrum, whereas sarcomata were more frequent in the ethmoidal region. He would again urge care before accepting the qualification "malignant" in regard to so-called sarcoma of the ethmoidal region. If these were sarcomata at all, they were of very low malignancy. True, they recurred locally, but showed little tendency to general dissemination, in which respect they differed strikingly from sarcomata of bone elsewhere in the body. The case he showed in November exemplified the excellent access which could be obtained from outside the nose. Though the tumour was vascular and the bleeding free, there was no trouble with blood running down, because that side was packed with gauze from the front, and so the tumour was isolated, as well as the field of operation, from the posterior pharynx. Before doing laryngotomy in such a case, it might be well to try the effect of Kühn's *per oral* intubation cannula. Usually that succeeded very well. If a sponge were used for the posterior pharynx it should have a very fine mesh.

Mr. E. D. DAVIS said that four years ago he had a similar case with Mr. Clogg, and that was an endothelioma of the ethmoid. Some considered it to be an epithelioma. A complete removal was done by commencing to excise the upper jaw, but the palatal process was left. The usual Ferguson incision of the cheek was made, and the whole facial surface of the maxilla was removed. The growth was followed up to the frontal region, and backwards to the sphenoid. The patient did very well for ten months, and then she developed a secondary growth in the brain, and died suddenly.

Mr. HARMER said that cancers might originate in the mucous membrane of the antrum, and the roof was a very common site; but they could also be found commencing on its nasal wall and floor. Though the antrum was lined with columnar-celled mucous membrane, when a growth was found there it was nearly always of the squamous-celled variety. On the other, hand, carcinomata, starting in the ethmoidal region, were generally columnar-celled, at least in their early stages.

Dr. H. J. DAVIS replied that the section in his case showed it was a spheroidal-celled carcinoma, evidently the result of pressure on the original cylindrical cells. The first operation consisted in removing polypi from the nose, and the lateral mass of the ethmoid came away with the curette. The tumour at the side of the malar bone was the size of a walnut. The case was first regarded as malignant disease of the upper jaw, and it was referred to him to ascertain whether there was disease in the antrum. He did not think such a large tumour could be connected with the antrum, as it appeared to be quite separate, but the skiagram showed that the disease had tracked from the ethmoid along the lower border of the orbit, and perforated the malar bone. He removed the tumour, and was able to curette away the disease by again opening the antrum; and as the lower part of the frontal sinus was also affected, he curetted that also. As the patient was very emaciated he hesitated about doing any more. There was no bulging of the palate, and he made the incision on the outer side along the floor of the orbit. He removed the tumour with a scoop and cauterized with Paquelin's cautery, and curetted the ethmoid and cauterized that area as well. These growths of the ethmoid were but slowly progressing. He did not agree with Sir StClair Thomson, because when disease started in the antrum the whole of the upper jaw was affected: but if it started in the ethmoid, secondarily invading the antrum, it hugged the superior wall, as in this case, and usually presented at the inner angle of the orbit. He had so far been unable to obtain radium treatment for the case. The patient was back at work, had put on weight, and was very much improved.

Case of Columnar-celled Epithelioma of the Nasal Cavity and Left Antrum.

By W. Stuart-Low, F.R.C.S.

C. S., a man, aged 50.

Pathological Report by Dr. Wyatt Wingrave.—"The epithelium is of columnar type arranged in irregular tubes. In parts infimbriated in appearance, with central core of vascular œdematous tissue and plasma cells. The growth bears a striking resemblance to epithelioma of the bowel."

This case illustrates well the slowness of the growth of a tumour of this nature and its non-liability to infiltrate and spread to other parts, also its great tendency to recur locally. Three very thorough operations have been performed, the first (three years ago) when the antrum was cleared of a mass of growth by the canine fossa route, the ascending process of the superior maxillary bone being removed to give a better view and access. At this operation it was found that the inner wall of the antrum had been destroyed by the disease, and the inferior and middle turbinals involved. In a year he returned with a recurrence in both antral and nasal cavities. A similar operation to the first was performed, and now after a lapse of two years there is again a return of the growth in the nose, but not in the antrum.

Laryngeal Tumour ; (?) Adenoma of Right Ventricular Band.

By Herbert Tilley, F.R.C.S.

H. A., male, aged 52, complained of hoarseness of ten to fifteen years' duration. The hoarseness varied in degree from time to time. No symptoms suggestive of tubercle. Wassermann reaction negative. The patient is a fine, healthy-looking man.

Note made August 11, 1913: Right ventricular band uniformly swollen, slightly congested, not ulcerated. Only posterior one-sixth of right vocal cord can be seen, and it moves freely on phonation.

Note, January 10, 1914: Right ventricular band is swollen to such an extent in its anterior five-sixths that only the posterior end of the vocal cord can be seen. Swelling is of globular shape, smooth, pale, and covered with a pale secretion. A small papillomatous growth can be seen on the anterior half of the left ventricular band. I removed a considerable portion of the right-sided tumour by the direct method, under local anæsthesia.

Note by Mr. T. W. P. Lawrence.—"This section is composed of gland-like tubes lined with cells two or three layers thick, the innermost being columnar, and in some places ciliated. The tubes have a well-defined basement membrane, beneath which is a fairly thick layer having the characters of adenoid tissue. The above structures lie in a loose fibrous stroma containing many vessels; the growth is not bounded by any definite capsule. The tumour is apparently of the nature of an adenoma originating from a crypt in connexion with the ventricle. The presence of cilia may be taken to exclude an origin from mucous glands."

DISCUSSION.

Mr. HERBERT TILLEY said that when he had removed the piece from the right ventricular band he could then see practically the whole length of the right cord. There was now some interarytænoid thickening and a rather congested-looking left cord. The Wassermann reaction had twice proved negative. The patient was such a fine specimen of manhood that tubercle seemed unlikely, especially in the absence of any physical signs in the lungs.

Mr. ROSE said that, having examined the microscopic specimen, he would scarcely use the word "adenoma"; it seemed to him to be a chronic inflammatory thickening.

Sir FELIX SEMON said that if he had simply seen the case and been told nothing about it, he would have said it suggested tubercle.

Mr. E. D. DAVIS said that two years ago Mr. Waggett and he had a very similar case to that shown by Mr. Tilley, a growth limited to the left ventricular band. A piece for section was removed and sent to Mr. Shattock, but he would not give an opinion on it. The case was followed up, tubercle bacilli were found in the sputum, and the case proved to be tuberculosis.

Mr. HERBERT TILLEY said that he first saw the case six months ago, when the left cord was apparently normal; but the right was in the condition described in the notes of the case. Four months later he was much more hoarse, and there was slight stridor. The man was in good health, there was no cough or general weakness, and it was difficult to believe the condition was tuberculous. He thought the inflammatory appearances in the section might be due to the mechanical irritation.

Frontal Sinus Burrs for enlarging the Fronto-nasal Canal when Operating by the Intranasal Method.

By Herbert Tilley, F.R.C.S.

The instruments are shaped like the ordinary frontal sinus probe, and the posterior and superior aspects of the burr are planed off so that it is practically impossible to damage posterior wall of the frontal sinus.

Mr. Tilley added that until a few days ago he was under the impression that the instruments were unlike any he had hitherto seen, but he had since ascertained that an almost identical means of enlarging the fronto-nasal canal had been invented by a Dr. Sullivan in America.

Maxillary Antroscope.

By Dan McKenzie, M.D.

An instrument modelled on the cystoscope, or naso-pharyngoscope, for examination of the maxillary antrum. It is introduced into the cavity through a trocar. The exhibitor had found difficulty in recognizing detail during the examination, but believed the ability to do so would arrive in time.

DISCUSSION.

Mr. Rose said that for some years he had been using a small cystoscope, occasionally, passing it through an opening made for the treatment of the antrum. His experience, however, like that of Dr. McKenzie, was that one got remarkably little detail, and therefore he had abandoned the use of the instrument.

Mr. Waggett considered that the efficiency of prismatic endoscopic instruments in nasal and sinus work depended upon the depth of focus of the optical system employed. Holmes's "nasopharyngoscope" proved highly satisfactory in these regions, parts almost touching the prism being clearly seen. The instrument was of the same size as that shown by Dr. Dan McKenzie, whom he congratulated on the addition of the cannula.

Dr. Kelson said in his experience it made all the difference whether the surface was wet or dry, for if wet one saw only a glistening reflex.

Dr. PETERS asked whether Dr. McKenzie had tried the instrument with the antrum full of fluid with the patient in the lateral position.

The PRESIDENT said the instrument was, to him, an old friend. He started with Valentine's salpingoscope ten years ago, and used it eighteen months for examining the Eustachian tubes, upper nasal fossæ, nasopharynx, &c., but he also found it difficult to get a comprehensive view of the parts. It was easy enough to pass the instrument through an opening in the inferior meatus into the antrum, but it was impossible to get a really good idea of what the interior was like. Perhaps, as Mr. Waggett suggested, the fault was a matter of focus.

Mr. NORMAN PATTERSON said that he had frequently obtained a good view of the antral cavity through the opening left in the antro-nasal wall after operation by using a very small post-nasal mirror. The nose should be first of all cocainized. The mirror would be more easily introduced, and a better view would be obtained, if the angle where it joined the shaft were made fairly obtuse.

Two Cases of Acute Suppurative Frontal Sinusitis, due to Bathing.

By C. W. M. HOPE, F.R.C.S.

CASE I.

C. B., MALE, aged 20, was admitted to Golden Square Hospital on September 23, 1913, at 8 p.m.

Condition on admission: Left frontal region red and swollen; fluctuation present. Eye closed; œdema over maxilla. Marked tenderness over frontal sinus. Pus in middle meatus; anterior end of middle turbinal red and swollen. Septal deviation high up to left. Patient felt and looked very ill. Temperature, 98·6° F.; pulse, 76.

Previous history: Swimming four days before admission, followed day after by pain and swelling around left eye.

Operation, 10.30 p.m.: Maxillary antrum punctured, full of pus; washed out. Incision made through eyebrow and continued down on to side of nose. On incising periosteum a large amount of pus escaped. Probing revealed a sinus through floor of sinus into upper part of orbit, periosteum stripped up into orbit for 1 in. and up on to front wall of frontal sinus for 2 in. Portion of floor cut away, also part of fronto-nasal process of superior maxilla to enlarge infundibulum. Bone of sinus walls did not bleed. The whole of inner lining of sinus was stripped off and found lying loose amongst pus. Anterior end of middle turbinal removed, large rubber drain inserted from nose into sinus, wound closed with silkworm gut sutures. Pus on culture proved to be pure *Staphylococcus pyogenes aureus.*

Subsequent progress: Swelling rapidly went down. Tube shortened daily; removed by end of seven days. Sinus washed out daily with iodine lotion, and discharge from sinus, at first great in amount, soon diminished. October 1: 100 million mixed staphylococcus vaccine. October 7: 100 million mixed staphylococcus vaccine. November 1: Temperature, 100° F.; puffiness at inner canthus, catheter impassable. November 2: Temperature, 100·2° F.; more swelling; inner end of wound opened up, pus escaped; small tube inserted into sinus; removed at end of four weeks. Daily catheter washings continued. November 27: Sequestrum felt in sinus with catheter. November 29: Radical Killian operation performed: whole of bridge and most of inner wall found to be necrotic, exposing dura. Fistula found leading into right frontal sinus. Excess of granulations gently curetted away, and wound sutured entirely except for tiny drain at inner canthus. Pressure applied to front and floor of sinus by means of tiny pieces of gauze. December 4: Dressed; stitches and drain removed. December 9: Dressed; tissues found to be firmly adherent to inner wall of sinus; wound firmly healed. Antrum punctured; clean. No discharge seen in nose. Resection of septum done to relieve narrowness of left nostril. December 31: Discharged cured. February 20: Deformity of operation markedly diminished; nose clean. There has at no time been any diplopia. Patient has been working every day since his discharge.

CASE II.

K. B., female, aged 14, was admitted to King's College Hospital on October 29, 1913, with œdema of left frontal region, eyes, and over maxilla.

Previous history: Perfectly well until she went swimming on October 22. Next day had pain in nose and left epiphora; swelling appeared on October 28. Temperature 100° F., pulse 108, on admission. Fomentations, hot inhalations ordered.

When seen by me on November 2 the left eye was completely closed; marked swelling on left side of face and left frontal region. Fluctuation over and around frontal sinus. Temperature 101·4° F., pulse 84. Left middle meatus full of pus and a few small polypi.

Operation same evening: Exactly similar condition found on operating as in Case I, but infection was a pure culture of streptococcus. Anterior ethmoidal cells being infected they were cleared out, otherwise same treatment carried out as in Case I. Temperature dropped to 99° F. after operation.

Following operation patient shortly developed very marked mental symptoms, "terrors" by day and night, and difficult to keep in bed at times. The sinus was washed out daily with iodine lotion, but temperature varied from 98·2° to 99·8° F. Tissues became adherent to bone forming anterior wall of sinus and wound healed up by first intention. Only a little discharge from nose on washing out sinus.

November 26: Temperature rose to 100·4° F. Some puffiness above eye. Fomentations, four-hourly, applied.

November 30: Wound reopened. Sinus found full of polypi and several sequestra. A large area of dura mater was exposed, covered with granulations. Sinus was carefully cleared of polypi and exuberant granulations and a drain left for four days at inner end of wound. Mental symptoms soon disappeared.

Subsequent progress: Sinus was washed out twice a week and then swabbed with 25 per cent. argyrol. Except for a little infection of anterior ethmoid cells patient has now completely recovered. There was never any infection of the maxillary antrum. Mr. Cargill reports slight diplopia in upper part of field only. Fundi normal.

DISCUSSION.

The PRESIDENT said he gathered that in both cases the patients were swimming in a bath, not in the sea. Some years ago there was almost an epidemic of accessory sinus infection as well as middle-ear disease, which developed in some into mastoid trouble, as a result of bathing in a particular bath in one of the mining villages of South Wales.

Dr. DONELAN said that in view of existing prejudices it was perhaps a pity that the form of bathing to which the disease was attributed in these cases was not specified. It could hardly be due to the harmless necessary wash. He found on inquiry that the youth was frequently in the habit of jumping into the water feet foremost, while the girl invariably did so. As well as he could remember, Sir StClair Thomson was the only authority who had called attention in writing to the objections to this form of diving on account of risk to the sinuses. In Ireland a very favourite form of bathing was what was known as fast jumping. The plunge was made head foremost, often from a great height, and the object to attain was, by a rapid throwing back of the shoulders, to come to the surface in time to catch the splash on one's head. It was very rare to find these bathers suffering from frontal sinus trouble, though the rather frequent occurrence of exostoses in the auditory meatus had been attributed by some authorities to this form of diving.

Dr. FITZGERALD POWELL said that the Section was indebted to Mr. Hope for bringing these cases forward; he thought they raised a very important point in connexion with nose and sinus suppuration—viz., that persons suffering from these affections should be urgently warned against bathing and plunging the head into water, as the infection from the nose might be spread to other sinuses and chronic conditions become acute.

Mr. WHALE said he thought that, as regards the girl, a second operation would be necessary, as there was much pus in the infundibulum at present. Her case almost exactly resembled a recent case of his. At the lower angle of the outer incision in this girl's case there was a tender lump, suggesting early keloid formation, and that was so in his case also. After the second operation the keloid thickening had spread so much that he had to ionize her with 2 per cent. sodium chloride through eight thicknesses of lint for twenty minutes, with a strength of 20 ma., once a week for five weeks, the negative pole being applied to the keloid scar.

Mr. NORMAN PATTERSON asked why Mr. Hope applied sutures in these cases. The best plan, he considered, was to leave the wound fairly widely open, and allow external drainage to take place. Subsequently very little scarring resulted. He did not think that immediate closure of the wound was a safe procedure.

Dr. PETERS said both these cases had required reopening, and no doubt the trouble was partly due to excessive formation of granulation tissue in the artificial infundibulum. He asked whether Mr. Hope in future intended to leave open part of the incision and close it when the suppuration had settled down, or whether he would close the incision at the first operation.

The PRESIDENT said that in these cases it was difficult to know when all the necrotic bone had been got away. He had had cases in which it was necessary to open again, to give vent to pieces of bone. That was largely due to one's conservative instincts, because one operated to relieve tension and give the bone a chance to recover or to prevent subsequent deformity.

Mr. HOPE replied that the front wall of both sinuses was laid bare, and there was no periosteum on either side. He thought he would give the tissues a chance to re-adhere. He sutured them up again, because he thought it would give the bone a chance of recovering. At King's College Hospital, for years there had been a notice stating that patients with a discharge from the ears should not bathe. He showed the girl not because her result was a good one, but because it illustrated the difference between trying to do a conservative operation and doing a complete Killian. Her case required something more. He had seen some terrible cases, in which there was left a permanent fistula at the inner angle. Sir StClair Thomson sutured his cases, using an aluminium bronze wire.

Case of Lupus of the Nose; Lupus or Chronic Tuberculosis of the Larynx commencing in the Left Ventricle.

By E. A. PETERS, M.D.

E. D., AGED 27, was sent to me by Mr. Cope in April, 1913, with the history of scraping for lupus four years previously. Active lupus was observed around the nose and on the septum and outer wall. There was also a patch of ulceration to be seen on the right lateral pharyngeal band. The left false cord was swollen, and hypertrophic ulcerated tissue protruded from the region of the ventricle. Injections of B.E. from $\frac{1}{40000}$ to $\frac{1}{1000}$ mg. were carried out in two series up to November, 1913. The reaction was never great and the local conditions improved so that in the larynx only a slight fullness of the superior cord remained. A child was born January, 1914, and the present condition indicates a general relapse with consolidation of the right lung (reported by Dr. Lakin). The evening temperature ranges round 100° F. The feature of the case is the transition from lupus at the nares to tuberculosis in the lung. The appearance of the larynx is of intermediate character and the process commenced in the ventricle. Is it necessary to invoke a double infection?

DISCUSSION.

Mr. A. J. MARTINEAU said the case was of interest as showing the influence of pregnancy on cases of lupus. In a case which Dr. H. J. Davis saw with him, it became necessary to advise a young lady with healing lupus of the larynx as to whether she might safely marry. On general grounds the advice tendered was to postpone the marriage until sound healing had occurred. The correctness of this advice was confirmed by the course of this case.

Sir STCLAIR THOMSON said it was not unusual for lupus, on marriage, to pass into tuberculosis of the lung. He had watched a case of lupus for fifteen years. As long as the patient remained unmarried the lupus was kept well under control, but marriage and motherhood were accompanied by a rapid spread, and the development of symptoms in the chest. He agreed that these people should be strongly warned against marriage.

Dr. Peters, in reply, asked whether it was a question of double or of single infection. In similar cases he did not think it had been settled whether the lung trouble was an extension of the lupus to the lung or a double infection. In cases of lupus it was not uncommon to see a distribution of the lupus by the blood, and deposits in the skin.

Case of Unilateral Abductor Paresis of the Left Cord.

By E. A. Peters, M.D.

E. S., a woman, aged 42, became suddenly hoarse three weeks ago and experienced a difficulty in swallowing fluids. General health good. Auscultation of the chest gave a negative result. On examination of the œsophagus a slightly ulcerated growth could be seen 8 in. from the teeth. Probably secondary glandular infection had involved the left recurrent nerve.

Tumour on the Left Vocal Cord.

By James Donelan, M.B.

Patient, a woman, aged 26, had been hoarse for several years. Operation on May 5, 1909, by Professor Gradenigo, of Turin. Voice improved but not clear. Had become again very hoarse in the last three weeks.

DISCUSSION.

Mr. Herbert Tilley said he saw a white projecting point on the left cord, around which the cord was congested, and the cord was not moving so freely as its fellow. He would not be surprised if it proved to be intrinsic malignant disease of the cord. He advised that it should be examined by the direct method.

Mr. Waggett said he derived much the same impression as did Mr. Tilley: the spike of white might even prove to be a piece of cartilage coming away.

Direct examination would leave no doubt as to diagnosis. The cord moved, but much of it had been cut away, and was at a lower level than the sound cord. It was a good case for the Killian's suspension laryngoscopy.

Dr. DONELAN replied that he had seen the case only once just before bringing the patient to the meeting, as he thought it was one of considerable interest. It might be a late recurring papilloma. Such forms of papillomata recurring after five or six years were included in the second group of Bruns's classification. It was, of course, possible that no recurrence had taken place and that the small amount of growth now present had escaped removal. He hardly thought this was likely to occur with an operator so skilled as Professor Gradenigo. Moreover, the voice had been much clearer since the operation until three or four weeks ago. He thought the perfect mobility of the vocal cord and the patient's age were against malignancy. Sir Felix Semon, who had also examined the case, but who had been obliged to leave early, had authorized him to say that, in his opinion, whatever the exact form, it was certainly some benign neoplasm. With such large teeth and so short a neck, he was inclined to use the indirect method. He would report the case later.

Laryngological Section.

April 3, 1914.

Dr. D. R. Paterson, President of the Section, in the Chair.

Discussion on the Intranasal Operative Treatment of Frontal Sinus.

(I) Introductory Paper by P. Watson-Williams, M.D.

Two years ago a special discussion took place in this Section on the "Present Position of the Treatment of Purulent Discharge from the Frontal Sinuses."[1] Now we propose to consider more fully one of the points touched on in that earlier discussion—viz., "The Intranasal Operative Treatment of the same Affections." In the course of my introduction to the discussion, in 1911, I emphasized "the complete efficacy of these intranasal methods in a considerable percentage," maintaining that they are "more desirable methods of treatment than external operation, even if not resulting in absolute cure, provided the symptoms are not such as to make more drastic operative treatment really necessary." Since that time endeavours have been made to devise improvements in the technique of intranasal operations, and to overcome some disadvantages and certain risks inherent to the methods hitherto employed.

It may be taken as common ground (1) that whenever operative measures are called for, an efficient intranasal operation, if that be possible, is to be preferred to external operation, unless (*a*) symptoms indicative of intracranial complications or of bone necrosis or osteomyelitis are present, (*b*) or there exist ocular complications, which render anything short of a complete radical operation a source of increased risk to the patient. (2) We are agreed on undisputed general principles (3) that we meet with cases of frontal sinusitis requiring no operation at all, while of those that do a certain percentage recover completely with simple catheterization after anterior middle turbinectomy (I do not propose to describe in detail these slight operative procedures which are universally recognized as being often efficient, and which we have all practised on many occasions); (4) we all realize that certain anatomical conditions must always impose limitations on the efficacy of any possible intranasal operation. We may, therefore, narrow down the discussion to a consideration of (1) the relative value of the various methods of operating intranasally for frontal sinus suppuration as measured by the increased percentage of cure or efficient relief afforded thereby; (2) their relative merit from the standpoint of safety.

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[1] *Proc. Roy. Soc. Med.*, 1911, iv (Laryng. Sect.), pp. 127-148.

Historical Survey.

Probably the pioneer in deliberately establishing drainage of the frontal sinus by an intranasal penetration of the frontal sinus was Schäffer, when, in 1890, he published his method of penetrating the floor of the sinus at a point corresponding to the medial part of the nasal crest of the frontal bone—i.e., internal to the attachment of the middle turbinal plate. To reach this he introduced a stiff metal sound 2 mm. thick, or a stiff steel spoon-ended sound, passing it up between the middle turbinal and the septum along the posterior surface of the saddle of the nose, where it was made to pierce the frontal sinus floor. He operated in this way twenty-six times without mishap. Schäffer was followed by Winckler, who employed a straight sound, and by Lichtwitz, who used a straight penetrator, 1½ mm. thick, and the latter reported successful penetration in three cases and failure in seven, after which he abandoned the procedure. In 1899 Spiess reported operation on eight cases. Experiments on the cadaver by Lichtwitz and Winckler render it very doubtful whether in these reported cases the frontal sinuses were really penetrated: both penetrated the cribriform plate in the course of their experiments on the cadaver. The same happened to Mermod, but unfortunately in a patient who died in consequence, in whom post-mortem examination showed that the frontal sinuses were practically non-existent. Hence the intranasal method was abandoned until, in 1905, it was revived by Fletcher-Ingals with this essential difference, that he aimed at enlarging the natural frontal sinus ostium by burring away obstructing ethmoid cells and the projection of the *crista nasalis*, instead of making an entirely new and more medial opening at the anterior end of the olfactory fissure. In 1906, Halle, of Berlin, described his methods, which he thought would overcome the inherent dangers of Ingals's operation, and more recently Good in 1908, Vacher in 1910, Segura in 1912, Sullivan, Denis, and others, have severally advocated what they believe to be useful advances in technique.

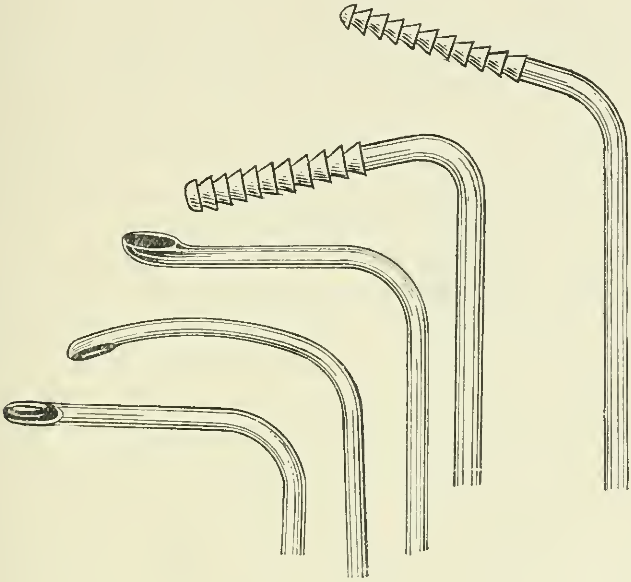

Fig. 1.

Two of Segura's raspatories and his three curettes (anterior, posterior, and lateral), the other lateral curette being the same reversed.

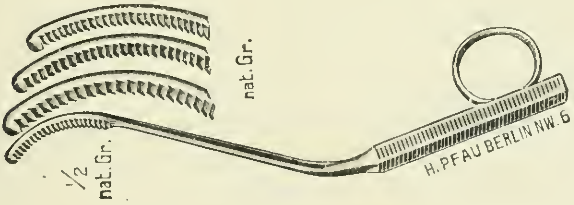

Fig. 2.

Sullivan's raspatories. (Vacher's are very similar.)

It is necessary here to mention more in detail the essential features of these various methods, although the chief credit of bringing the intranasal method once more into the field of practical rhinology belongs to Fletcher-Ingals, of Chicago, and next to him to Halle, of Berlin, to Vacher and Denis, of Orleans, and to Segura, of Buenos Ayres.

Fletcher-Ingals's instruments were exhibited at the Laryngological Society of London by Dr. Dundas Grant a few years ago. They consist essentially of a pilot, or frontal sinus probe, which, after a previous anterior middle turbinectomy, is passed into the frontal sinus through the duct, and serves as a guide until it reaches the point of obstruction, when a burr is threaded over the pilot to burr an open way to the sinus of the same diameter as the burr—viz., 6 mm.; when the instruments are in position and current turned on the burr is gently pressed upwards and finally drawn forwards, and cuts its way into the frontal sinus in two or three seconds. With a packer he then introduces packing into the sinus: a strip of sterilized gauze, 1 in. wide, saturated with a 20 per cent. solution of zinc chloride. Finally, a gold drainage tube is slipped into the enlarged drainage canal, and the operation finished. The drainage-tube is retained automatically in position because it has a four-split end; this spreads on the solution of a gelatine capsule, which keeps these spreading ends together when introduced, a most ingenious device. Fletcher-Ingals's results in twenty-nine cases were cited in my previous introduction.[1] He claims that the operation could be performed in 95 per cent. of all chronic cases, provided the anterior end of the middle turbinated body has been removed, that healing is rapid, and that the operation will leave as large a canal as desirable. Ingals, writing to me a few days ago, stated that he had operated on between forty and fifty cases. One died from meningitis following injections of peroxide of hydrogen.

Max Halle introduces a probe as high as possible into the frontal cavity, and over the probe he slides a narrow protector of flexible metal which adjusts itself somewhat to the posterior wall of the sinus posteriorly. The probe is then removed, and he advances with a bore drill along the front of the protector in a forward and upward direction, taking care to keep close to the protector, and in this manner with a sharp-ended drill he drills away the anterior ethmoid cells, and higher up the nasal crest. When he has entered the sinus he further burrs down the nasal crest with a blunt-pointed drill. In Halle's hands this method does not appear to have been attended with any untoward result, and he states it has always, when successful, made a very free entrance into the frontal sinus.

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[1] *Proceedings*, 1911, iv, p. 130.

Segura[1] has long advocated the intranasal operation, which he first performed early in 1905. His special instruments consist of a series of cutting sounds of different curve and thickness, flexible curettes which have their cutting edges in different directions, forwards, backwards, right and left (fig. 1). The cutting sounds are passed up the nasal duct, after previous removal of the anterior end of the middle turbinal, and, having been entered as far as they will readily go, they are pulled forward as they are withdrawn, so as to curette away the fronto-ethmoidal cells and the nasal crest. After the fronto-nasal passage has been freed as much as possible the operation is finished by means of the cutting curettes, which further enlarge the canal in all directions, great care being taken when using the back-cutting curette. Segura states that he has operated in a large number of cases with uniformly good results, and in no case was there untoward result.

Others have used similar methods, notably Vacher, and also Sullivan, who some few years ago used the cutting sounds, made safer by having a smooth posterior border very similar to those designed this year and shown at the last meeting of this Section by Mr. Tilley,[2] and by myself (in the skiagram of a patient); this device, therefore, being by no means a new one. Good uses chisels to cut away the nasal crest, and wears down the remainder as far as possible by means of a kind of curette.

One realizes then that much pioneer work has been done by those to whom our thanks are due for initiating an operation which greatly enlarges the natural frontal sinus passage, as distinguished from the now abandoned operation of making *de novo* a new opening into the floor of the sinus through the roof of the olfactory fissure. My own later methods of operation were due to a conviction that the methods of Ingals and Halle appeared too dangerous, while on the other hand the more usual method of removing the anterior end of the middle turbinal and clipping away the bulla and ethmoidal cells from the lower end of the fronto-nasal passage and thence working upwards were ineffectual in such a large proportion of cases.

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[1] "The Treatment of Chronic Frontal Sinusitis by the Intranasal Route," read (August, 1909) at the Latin-American Congress, published in *La Semana Médica*, Buenos Ayres, 1912, xix, pp. 959-87.

[2] *Proceedings*, p. 113.

CLINICAL ANATOMY OF THE REGION.

Examination of a number of skulls brings home the fact that, clinically, the ethmoid cells are not strictly confined to the ethmoid bone. The eminence of the agger on the upper part of the inner surface of the nasal process of the superior maxillary bone is usually cellular, then the one or two most anterior cells correspond to the agger nasi, while the inner surface of the lachrymal and nasal bones close the anterior cells of the ethmoidal labyrinth, which run in front of the fronto-nasal duct right up to the bony ring of the frontal sinus ostium in the internal angular process of the frontal bone. To avoid confusion we may speak of these groups of cells lying in front of the middle turbinal as anti-conchal cells. The term "agger cells" (which are not always present) should be restricted, as heretofore, to cells in the agger.[1] The frontal sinus ostium is a

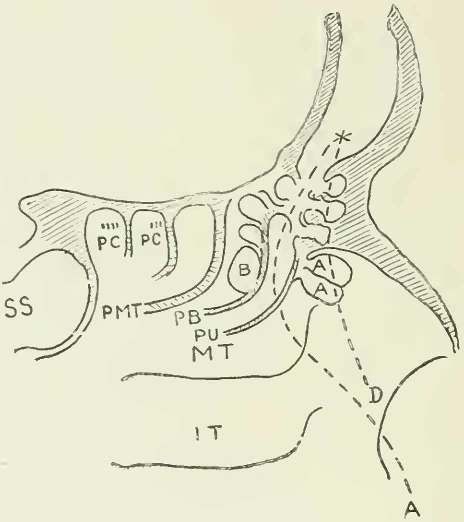

FIG. 3.

Diagram of the ethmoidal labyrinth and fronto-ethmoidal cells, showing the curved entry, A to *, of the old method of catheterization of the frontal sinus, as compared with the direct anterior method of entry advocated, D to *—i.e., the creation of a new artificial fronto-nasal passage. A, A, agger cells; PU, plate of the uncinate process; PB, plate of the bulla, B; PMT, plate of the middle concha; PC''' and PC'''', plates of the concha superior and concha suprema.

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[1] Developmentally, the agger cells arise in the fœtal turbinal of the uncinate process, termed by Killian the naso-turbinal.

bony ring bounded in the front by the posterior margin of the nasal crest; the nasal crest projecting backwards forms the sloping floor of the sinus in front of the ostium. The vertical plate of the middle turbinate descends from the under surface of the cribriform plate, which lies to its inner side above, and terminates below in the free convoluted margin of the middle turbinated bone. As the vertical plate forms the inner boundary of the anterior ethmoidal cells we tend to avoid risk of injury to the cribriform plate by retaining the vertical plate, restricting all operative measures to its outer side. The outer boundary of the ethmoidal labyrinth in this region is formed by the lachrymal bone. The width of the potential passage between the inner and outer boundaries varies with the development of the intervening cells, but in its narrowest part corresponding approximately with the level of the inner canthus. I find it measures in the adult from 7 to 12 mm., and therefore the width of an instrument intended to clear the space of obstructive cells should never exceed 6 mm. It was necessary also

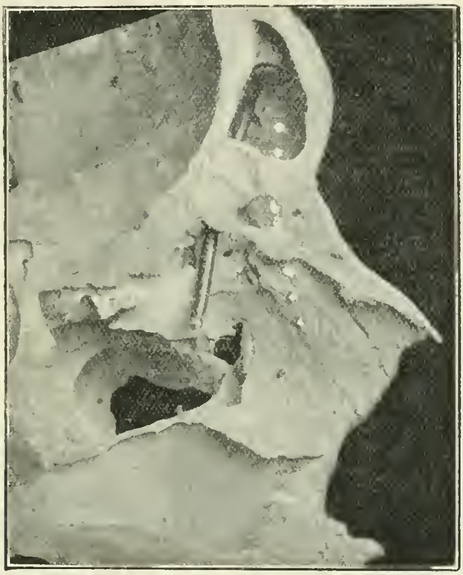

Fig. 4.

Bone specimen showing the fronto-nasal passage with probe passing through; the dotted line shows the route of anterior entry through agger and other anticonchal cells. Note the "anterior entry" is well in front of the cribriform plate.

to consider the relations of the lachrymal sac and canal to the operative tract. The lachrymal duct lies below the operation field, but the lower level of the sac corresponds to the agger nasi, and the upper limit of the sinus lachrymalis often reaches the level of the cribriform plate or the thick upper end of the nasal bone at its junction with the crista nasalis of the frontal bone. Hence it seemed safest to use blunt-nosed forceps to clip away the projecting walls of anti-conchal cells. In patients whose fronto-nasal passage is obstructed we may throw all the fronto-ethmoidal as well as the agger cells into one, thereby creating a direct opening to the frontal sinus ostium above or in front of the middle concha. It is surprising how free and large is the entry to the frontal sinus ostium which is at once obtained in this usually simple manner, and if the frontal sinus ostium is too small it may then be safely enlarged towards the front by partial removal of the nasal crest by fine burrs rather than by chisels, which would more readily enter the orbit, besides introducing a source of grave danger to a low-lying posterior frontal sinus wall.

It is assumed that the extent and depth of the frontal sinuses have been determined by skiagrams prior to operation.

THE OPERATIVE TECHNIQUE.

The operation based on these anatomical data is performed under either local or general anæsthesia[1] with small cutting forceps, burrs, or rasps in the following manner:—

(1) With small angular ethmoidal forceps engage the anterior margin of the middle turbinal at its point of attachment to the outer nasal wall. Cutting through this the forceps enter the anterior ethmoidal cells in front of the fronto-nasal passage (*see* fig. 6).

(2) Keeping to the outer side of the vertical plate of the ethmoid, clip away all the agger cells and the other anti-conchal cells right up to the crista nasalis (fig. 7).

(3) The anterior ethmoid cells lying behind or above the fronto-nasal duct, including the bulla ethmoidalis, are now removed by the forceps as far back as may be necessary.

(4) Using the larger forceps, the thicker projecting partitions of the cells are laid open and punched away. Only the blunt tip of the female blade can come in contact with the roof.

(5) The bougies (fig. 13) are then passed into the sinus, so as

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[1] It is no more painful than a septal submucous resection, and usually much shorter.

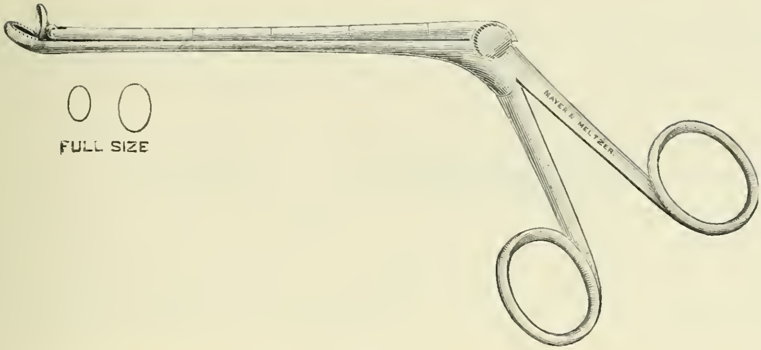

FIG. 5.

The author's spheno-ethmoidal angular forceps, made in two sizes. All the instruments are marked in inches from the tip, so that the precise distance from the naris that any instrument has been passed can be at once determined.

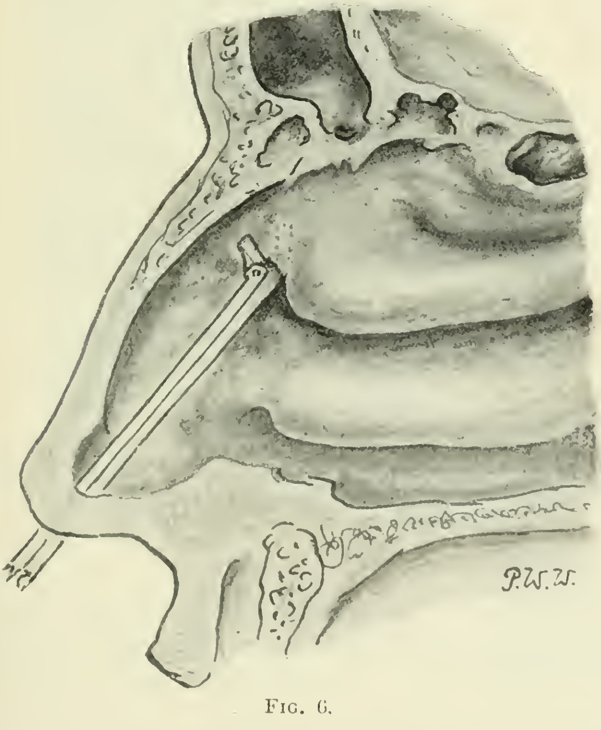

FIG. 6.

To show the initial point of entry in the intranasal frontal sinus operation. The small spheno-ethmoidal forceps are seen cutting the point of attachment of the middle turbinal to the outer nasal wall, thus entering the fronto-ethmoidal cells.

to gauge the size of the fronto-nasal channel thus formed. Usually Nos. 18 or 19 will enter, sometimes 19-23, or 19-25. (The figures give the circumference in millimetres, hence 19 has a diameter of 6·05 mm., or $\frac{1}{4}$ in. A 19-25 bougie measures 6 mm. in width and 8 mm. in antero-posterior diameter.) If such a large bougie will not enter, the bone corresponding to the nasal crest *may* be shaved away by the sliding cutting forceps (fig. 14) till these large sizes can be introduced, or the crest reduced first by the smaller guarded burr, or a small-sized sharp raspatory (fig. 8), till the passage admits the burr or forceps. When a No. 10 enters the sinus the bony boss can be burred away first with the 4 mm. wide burr until it enters the sinus (fig. 10). When the frontal sinus opening lies well to the outer side and tends to guide entering probes towards the orbital roof, unless contra-indicated by skiagram, it is well to draw the sliding forceps or burr towards the front so as to enlarge the frontal ostium to the front and inwards rather than towards the orbital roof outwards.

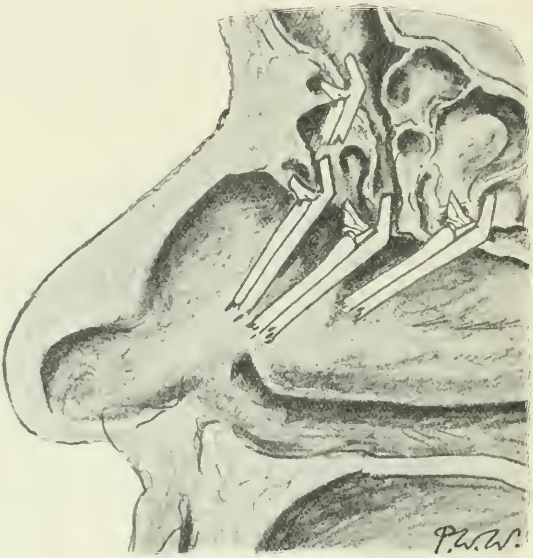

FIG. 7.

To show the author's small spheno-ethmoidal forceps clipping down walls of the ethmoidal cells external to the vertical plate of the middle turbinal.

(6) With the small forceps, which now enter freely, the projecting walls of any remaining ethmoidal cells may be clipped away to render the passage more free.

(7) The sinus is well lavaged at this stage, and finally the anterior end of the middle turbinal may be removed, as when it is left intact the channel may be narrowed by subsequent granulations.

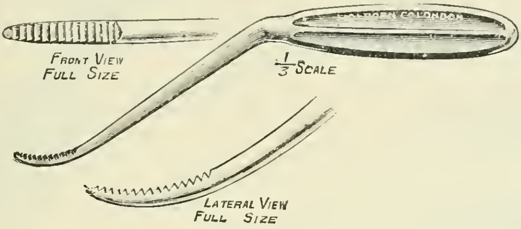

FIG. 8.

The author's small raspatory. At the tip it measures only 2 mm. in width, and it can only cut forwards; the end also is blunt.

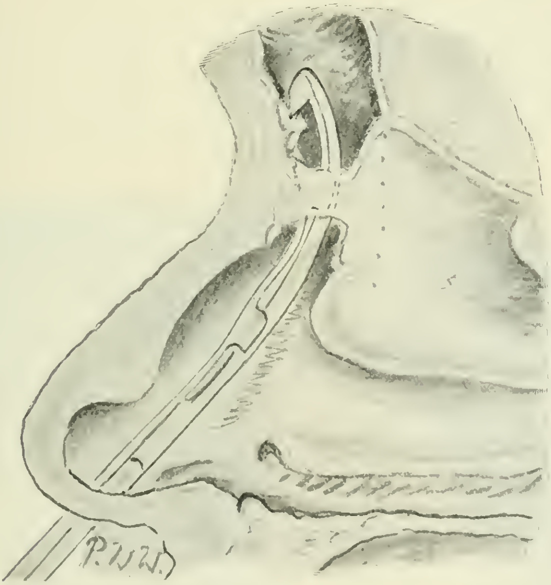

FIG. 9.

•The sliding cutting forceps reducing the crista nasalis and projecting bony ridges after the cells have been opened by the small cutting forceps. The middle turbinal shown in situ. The dotted line shows the forward extent of the cribriform plate.

The extent of the operation varies with the clinical conditions requiring relief, which determine whether the crista nasalis should or should not be reduced. In the majority of my cases I have not found

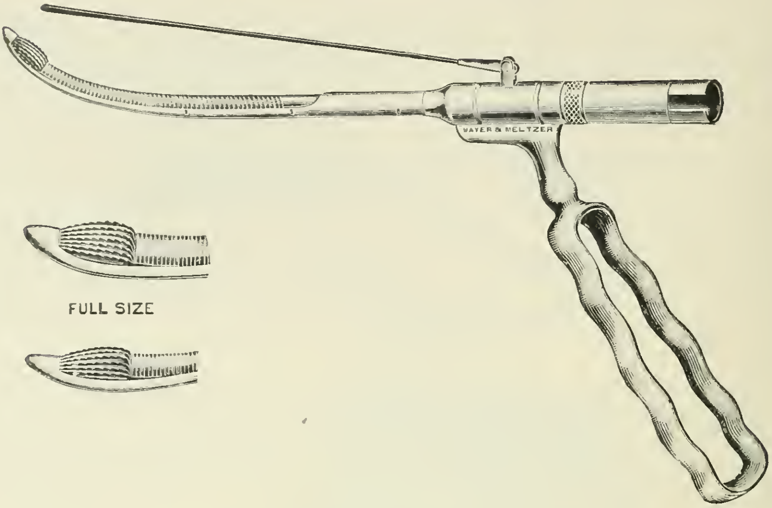

Fig. 10.

The author's guarded rotating burrs, which are fitted with a standard No. 2 Asch's "slip-on joint." The burr having been passed up the nose to the seat of obstruction, the nasal crest, the straight indicator, which is movable, is made to lie against the face outside and its tip indicates the position of the burr in situ.

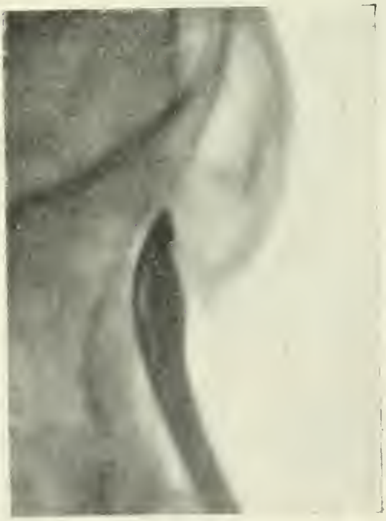

Fig. 11.

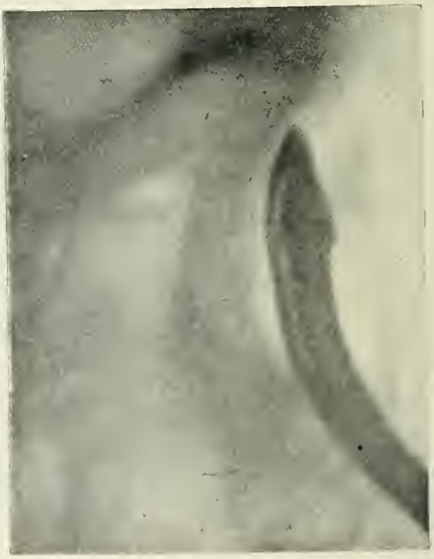

Fig. 12.

Fig. 11.—Skiagram showing the 4 mm. wide guarded electric burr reducing the crista nasalis in a patient.

Fig. 12.—Skiagram of patient showing 6 mm. burr on nasal crest.

it necessary to reduce the nasal crest by rasp or burr; the simple removal of fronto-ethmoidal cells, and, in some cases, biting off a thin projecting anterior margin of the ostium, affording an easy passage to a 6 mm. thick, or at least a 4 mm. thick bougie. This relatively simple procedure one may term the partial operation, as compared with the complete intranasal operation which involves reduction of the nasal crest by burring or other means. The complete operation is desirable when, with a large sinus, there is reason to believe polypoid degeneration

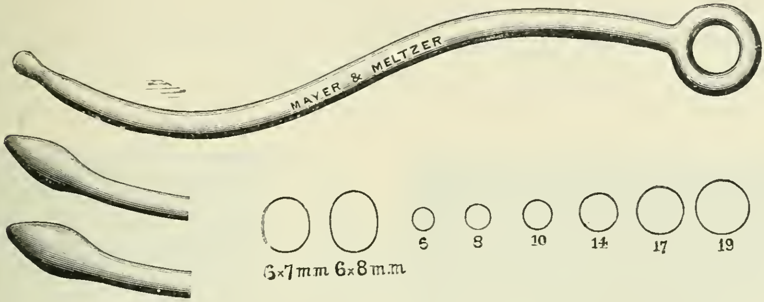

Fig. 13.

The author's frontal sinus bougies, two-thirds actual size; above, the round bougie, below, the swan-head ends. The sectional area of different sizes is also shown. Assuming the normal fronto-nasal duct to be 2 mm. wide, the passage of a 6 by 8 mm. bougie shows that the duct has been enlarged twelve times.

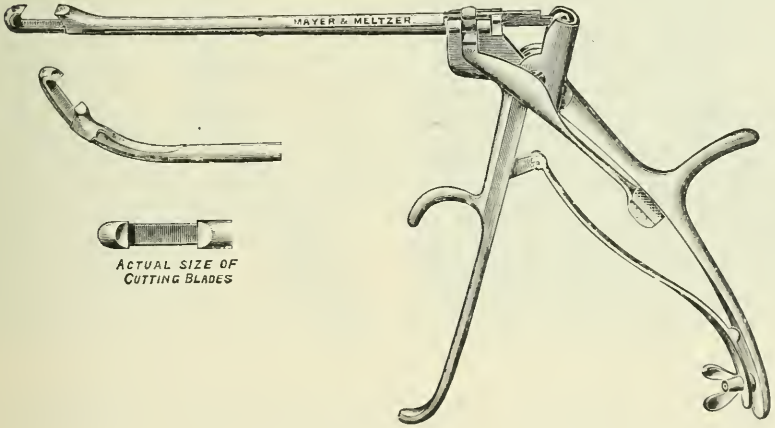

Fig. 14.

The sliding cutting forceps, curved and straight, for attaching to the universal handle.

exists, or when the partial operation fails to afford permanent relief, or when the simple removal of the fronto-ethmoidal cells leaves such a narrow entry that a larger artificial duct is required.

One advantage that may be claimed for this method of entry as compared with methods with unguarded burrs is that the mucous membrane is not stripped from the posterior and lateral walls of the new passage, for although the cell partitions are clipped away the mucous membrane of the cell bottom is mostly retained. Only anteriorly is the bone laid bare, and that for a strip about 6·5 mm. wide, and this can apparently recover itself by extension from the muco-periosteum on either side. Is it not better to have a 6 or 7 mm. wide passage

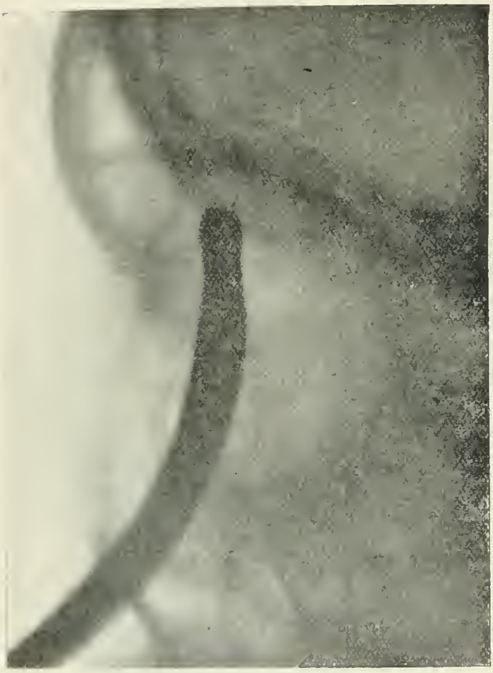

FIG. 15.

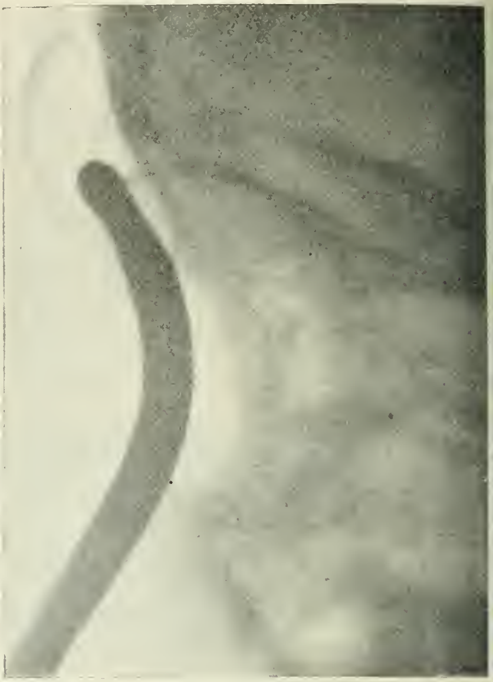

FIG. 16.

Fig. 15.—Skiagram showing 6 mm. thick round bougie entering frontal sinus, but carried back so as to impinge against tabula interna because the nasal crest is thick.

Fig. 16.—The same case, but showing the 6 mm. (No. 19, Freuch scale) bougie entering well into the sinus after reduction of the nasal crest by burring.

which is lined with mucous membrane than a wider one which can only granulate over and which is much more liable to subsequent contraction?

A septal deflection, unless so pronounced and so situated that it is impossible to reach the operative field, should be left to be dealt with when the infected sinuses have recovered or are more healthy; if necessary the septum can be pushed over to the other side by a Killian speculum. I have operated successfully on a frontal sinus when a septal deflection concealed from sight the middle turbinal and every part of the operative field.

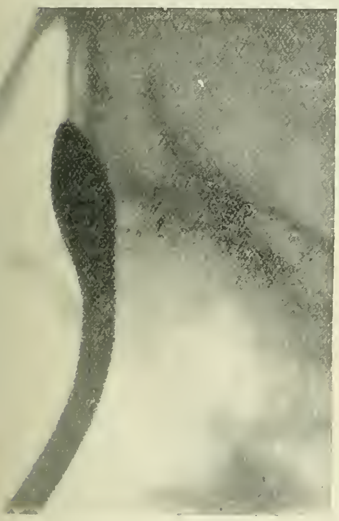

Fig. 17.

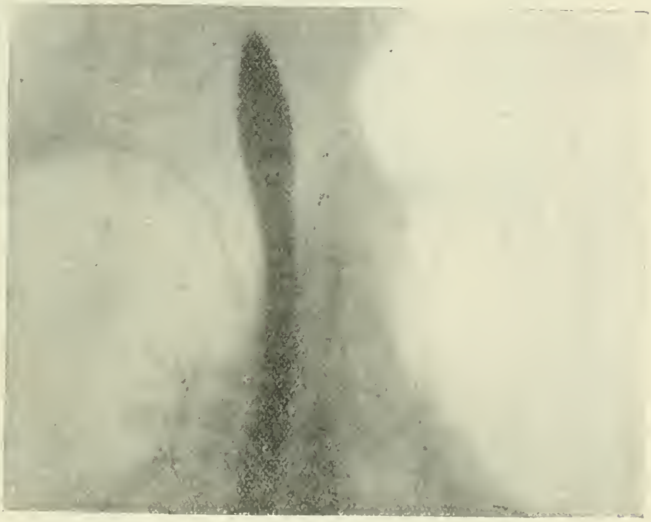

Fig. 18.

Skiagrams showing Watson-Williams's swan-head bougie, 8 mm. by 6 mm., entering the frontal sinus after removal of crista nasalis.

Fig. 17.—Case of W. C. Lateral view of left frontal sinus and swan-head oval bougie.

Fig. 18.—The same, antero-posterior aspect. The skiagram shows the right sinus healthy, the left sinus containing the bougie being diseased. (Skiagram reversed in print.)

After-treatment consists:—

(1) In lavage of the sinus, first with saline solutions and weak peroxide of hydrogen and some mild antiseptic, such as colloidal or other silver preparations, iodine solutions, and so forth, and later with stronger solutions if necessary.

(2) In the passage of the largest bougie the canal will take comfortably, repeated at short intervals to prevent adhesions, and to insure the passage remaining widely open until the sinus has become healthier, or the discharges disappear.

(3) The use of vaccines, &c., has to be considered. But in cases of streptococcal infection it is always safer to give 30 to 50 c.c. of polyvalent antistreptococcic serum immediately before operating, and follow with sensitized vaccines.

(4) I prefer not to use a drainage-tube, and to avoid all packing of the sinus. Occasionally a small curette may be used in the sinus to remove polypoid mucous membrane.

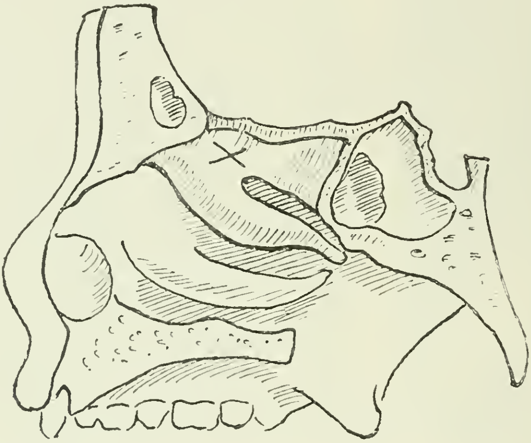

Fig. 19.

Traced from Mosher's diagram to show, **X**, the point at which he carries his curette into the ethmoidal labyrinth.

If a sufficiently wide fronto-nasal passage to admit a bougie 15 mm. in circumference is obtained without cutting away the thick part of the nasal crest, and the sinus infection is recent, or there is no reason to believe that polypoid degeneration of the mucosal lining has occurred, I do not use a burr or other means for cutting away any part of the floor of the sinus unless subsequent observation seems to render this desirable. (Provided efficient drainage is maintained, and the patient has been relieved of pain, headache, and inconvenient discharge, only the lesser operative measures are performed.)

As regards results, statistics are, I think, of no value unless details of the history, symptoms, and complications are given, as well as a

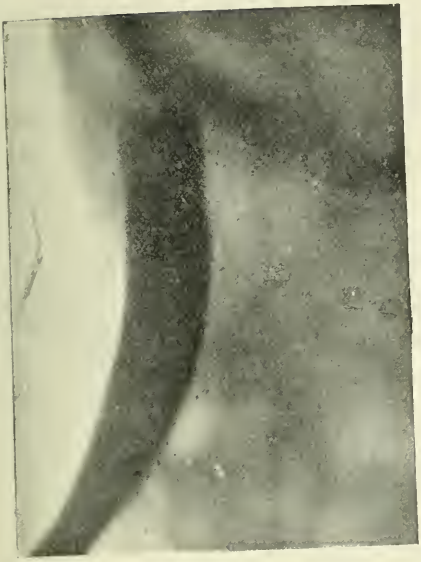

FIG. 20.

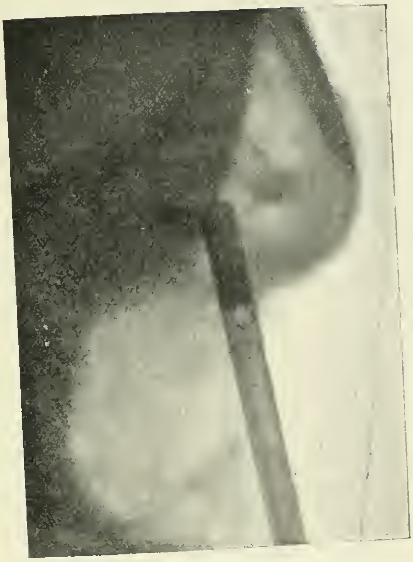

FIG. 21.

Fig. 20.—Skiagram of patient. Large bougies in both frontal sinuses.

Fig. 21.—Skiagram of patient with endo-rhinoscope passed into frontal sinus.

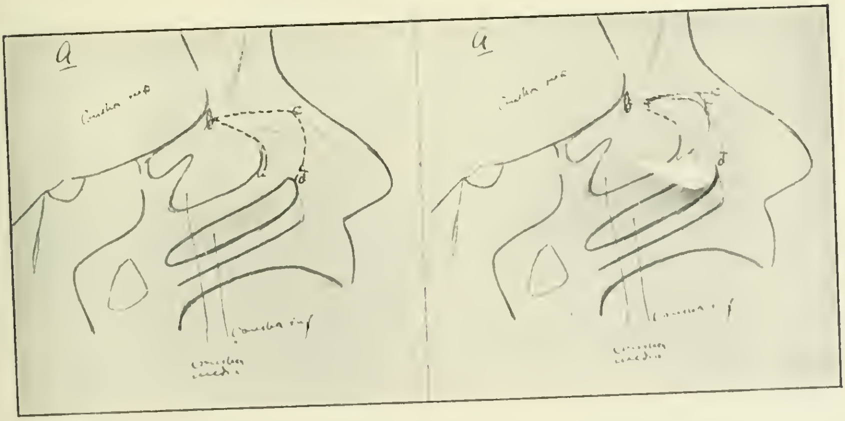

FIG. 22.

FIG. 23.

Figs. 22 and 23.—Diagrams by Max Halle to show (1) the incisions, *a*, *b*, *c*, *d*, for making his muco-periosteal flap; (2) the flap turned down ready to be tucked beneath the middle turbinate till the operation on the exposed fronto-ethmoidal area has been completed.

description of the anatomical conditions encountered. In some cases of long-standing frontal sinus suppuration, with polypoid degeneration of the mucosa, and particularly in cases where extensive polypus formation in the region of the unciform process co-exists, the fronto-nasal passage is altogether abnormally large, and no symptoms beyond discharge may be present. Between these excessively large ducts and the very small tortuous channels which are particularly prone to determine the occurrence of an acute or chronic frontal sinusitis there is every degree of relative obstruction to the drainage of the sinus secretions. The co-existence of other sinus suppurations will also largely influence the results obtained by establishing good frontal drainage. But apart from such factors, which are largely under control by intranasal operations, the anatomical arrangement of the ethmoidal cells in relation to the frontal sinus and its exit, and the size and extent of the sinus itself, must often render it impossible to obtain satisfactory results even though a large direct fronto-nasal passage can be made or already exists.

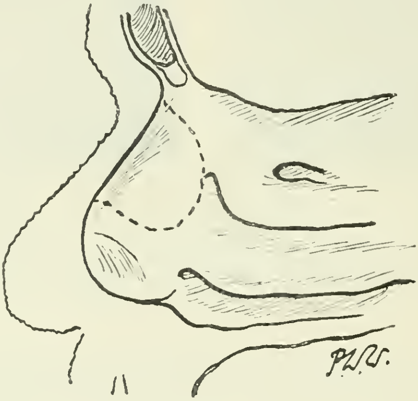

Fig. 24.

Diagram showing muco-periosteal flap employed by the author.

I find that in my hospital clinic, and in private, fifty-one cases have been operated on by the anterior methods of entry described. One patient died, and though that death could not have been in any way due to the frontal sinus operation, it must be mentioned. In three cases external operation had to be performed in consequence of the failure to obtain relief by intranasal methods. In a considerable percentage an apparent cure resulted (in eleven out of twenty-two private cases that I can trace), in others relief has been such as to negative any question of an external operation. At least some of those cured would doubtless have been cured by the older method of intranasal lavage after removing the anterior end of the middle turbinal, &c. But there is no doubt in my mind that many of the cases completely relieved would have required external operation if efficient drainage had not been obtained by the later method of operation. The patient who died was admitted to the Royal Infirmary with an external fistula leading to a suppurating right sinus of several years' duration. I found he had double antral suppuration and polypi in each middle meatus on both sides. The anterior ethmoidal cells were freely opened, including the anti-conchal cells, the crest reduced by a rasp, and a double intranasal antral operation performed. The frontal sinuses admitted a No. 19 bougie very easily. I avoided exploring the sphenoidal sinuses as there were no symptoms pointing to them, for with such extensive opening up of the other sinuses I wished to avoid increasing the operative field after a double intranasal antral sinus operation. Death, eight days later, was due to general septicæmia, but there was no trace of meningitis or of any probable source of infection from the frontal sinuses.[1]

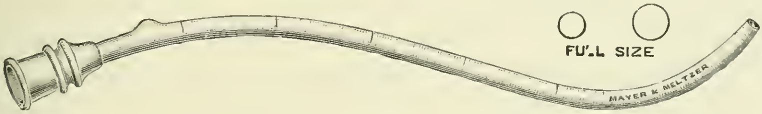

Fig. 25.

The author's flexible metal frontal sinus cannulæ.

Mosher, whose recent laborious researches on the applied anatomy of the frontal sinus and fronto-ethmoidal cells deserve our fullest recognition and thanks, has emphasized the clinical importance of the agger cells, and has devised a routine method for catheterizing the frontal sinus and exenterating the anterior ethmoidal cells. He states that "the point of attack is the agger nasi cell, if it is present and its mound can be recognized; if not, the upper part of the anterior end of the middle turbinate. The external guide is the inner canthus of the eye. . . . The mastoid curette, with a long handle and a bowl about ½ cm. wide, is the most convenient instrument to work with. Having located the mound of the agger nasi cells or, if it is not present, having brought into view the anterior end of the middle turbinate, the curette is pushed upward into the olfactory cleft with the cutting edge outward and aimed, and then pressed toward the lachrymal bone. If the curette is in the right place (fig. 19) it easily enters the ethmoidal labyrinth. The curette has an allowable excursion varying with the labyrinth of ½ cm. to 1½ cm. If the curette is carried too far it enters the orbit. . . After the initial outward plunge the handle of the curette is brought into the line with the antero-posterior axis of the labyrinth. With the bowl up and the cutting edge downwards, the curette is carried backward and downward, until the bulla has been entered and destroyed. This means a backward excursion of ½ in. . . . The loose part of the middle turbinate is now cut off with a conchotome. The cutting surface of the curette is now turned forwards and a little outward and brought forward until the flint-like posterior edge of the superior maxilla is encountered."

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[1] "There was a large area of cellulitis in the left leg. . . Meningitis was not found either at the frontal area or over the cortex. On opening up the sinuses the right sphenoidal and right frontal sinuses contained muco-pus. The left frontal sinus was free from pus. The bone in the fronto-nasal region did not show any sign of inflammatory exudate, the diploë appearing normal. There was not any evidence of thrombosed veins; the entry of the organisms must have taken place through other channels than these."—From Report of Autopsy by Professor Walker Hall.

I would here emphasize two points to be borne in mind: (*a*) While a very large percentage of frontal sinuses are easy to enter and to drain, it is just the remaining small percentage in which the anatomical conditions make it both difficult for the discharges to drain and for the operator to effect drainage, and we must judge of the merits of any operative measure by its efficiency in overcoming the difficult conditions in which other and perhaps simpler procedures cannot suffice. (*b*) External operation has proved very successful in curing frontal sinus suppuration without cosmetic deformity when the sinuses are small, and do not favour such large and free intranasal entry as, other things equal, the fully developed sinuses. With small sinuses there is less reason to avoid external operation, and therefore when efficient intranasal drainage is difficult to obtain there is less reason to avoid the more radical external operation and less excuse for exposing the patient to risks from intranasal operation.

Since writing the above I have been enabled, by the courtesy of Max Halle, to bring to your knowledge his most recent modified operation, hitherto unpublished, and the fact that he has felt it desirable to improve on his published method shows that he too has realized the risks of his previous operation. The following paragraphs are translations from Halle's letter to me:—

"An incision is made through the mucosa and periosteum, on the agger nasi, immediately in front of the middle turbinal, beginning as high up as possible in and descending alongside the frontal edge of the turbinal, to end in the middle meatus close to the head of the turbinal. From the upper end of the incision the cut is carried by the lateral nasal wall as far as the nasal bridge, and thence descending in a curve to end in the vicinity of the upper edge of the inferior turbinal (figs. 22, 23). The resulting flap is detached from above downwards, and is turned back and held by a small pledget under the middle turbinal. Now the edge of the middle turbinal is detached, and after that the agger narium is chiselled away. One may chisel laterally rather far without the least danger. In this way the foremost ethmoid cells are laid bare; the ethmoid bone is now cleared with suitable instruments. By this process one can—anyhow in all suitable cases examined by me up to now—introduce a probe into the frontal cavity with the greatest safety. This is—I always lay great stress on the point—the preliminary condition for intranasal operation, should the opening already obtained not suffice. In the latter circumstances, the opening admits my smallest pear-shaped burr with blunt rounded top; it only cuts when led downwards. The floor of the frontal sinus is now burred away, first with small and then with larger burrs. The cavity is exposed widely, and one can not only see into it, but also probe it thoroughly, and, if necessary, remove the diseased mucosa entirely with my sharp pliable spoons. The great advantage of the present method is that one can avoid the sharp burrs before used, and which had to be covered with a protector to force a way into the cavity. At the end of the operation the flap is laid into the deeply created cavity of the lateral wall. I have up to now operated in forty-eight cases in the old and the new method, and I have not been unsuccessful in any single instance."

My own method of exenteration would, I think, be easier to perform, and, in my hands, safer than Halle's or Mosher's or Tilley's, which closely follows the latter. I feel, too, that with an infective purulent discharge we should avoid opening up a bare tract so close to the cribriform plate, and I therefore always keep intact the upper part of the vertical plate, which is the first part that Mosher destroys.

I have, as an outcome of Halle's flap, quite lately tried making a flap of muco-periosteum by making an incision at the highest point one could reach above the point of attachment of the middle turbinal.

carrying the incision down in front of the middle turbinal to the level of its lower margin, then straight forwards and upwards to end below and in front of the agger nasi, the resulting flap being detached and held against the septum until the end of the operation, when it should be replaced. There was no difficulty in getting it to reunite in situ, but, except in rare cases, where the nasal passage is much narrowed by an inward projecting posterior margin of the nasal process of the superior maxillary bone, I find it offers no advantage (fig. 24).

I would like to add a word of thanks to the Librarian of the Society who has greatly facilitated the preparation of my introductory paper by looking out numerous references on the subject and placing at my disposal the various publications which the Library of the Society contains.

PATIENTS DEMONSTRATED AT THE MEETING OF THE SECTION.

Example of the "Incomplete" Operation: Subacute Case, with Nose too Narrow for Inspection of Operatic Field; Operation at One Sitting; General Anæsthesia.

Mr. F. B. On January 15, 1914, was seen, in consultation with Dr. Visger, for mastoiditis with view to operation. Symptoms of acute mastoiditis of two weeks' duration—but he had a similar slight attack twelve years before. Had suffered from right supraorbital neuralgia during December, 1913; pus seen in middle meatus far back, at times cacosmia. Right antral exploration with suction syringe yielded pus. Skiagram showed right frontal sinus blurred.

Right antral intranasal operation, with partial removal of posterior border of nasal process as it encroached on and narrowed the nasal passage. Anterior entry of right frontal sinus by removal of fronto-ethmoidal cells enabled a 6 mm. thick bougie to enter freely. Antral pus film, G. P. streptococci; some phagocytosis. Antral pus culture, G. P. streptococci; no staphylococci. At the time of operation 50 c.c. of antistreptococcic serum were injected. Sensitized streptococcal vaccines (autogenous) followed, dosage 75 million up to 450 million.

The ear simply treated with H_2O_2 and glycerine of carbolic acid. Discharge almost ceased. No headaches since the operation.

The patient can pass a bougie into the sinus and lavage himself.

Example of the "Complete" Operation: Case of Left Frontal Sinus Suppuration, &c.; Chronic Frontal Sinus Suppuration; Operation Field in view; Operations on Sinus under Cocaine—First, Anterior Entry by Removal of Fronto-ethmoidal Cells; Second, Burring of Crista Nasalis; Admitted Oval Bougie 8 mm. thick antero-posteriorly and 6 mm. thick laterally.

W. C., male, aged 30. Subject to left supraorbital headaches for many years, but two years ago they became very severe, and then were relieved by discharge of pus. Recurrences ever since, usually once a week or so. His left antrum was opened and drained in 1912. On March 16, 1914, nothing larger than a 2 mm. cannula would enter his left frontal sinus. Anterior entry and removal of fronto-ethmoidal cells allowed admission of a No. 19 (6 mm.) bougie. On March 18 the crista nasalis burred, so that a No. 19-25 bougie entered (8 mm. by 6 mm.).

No headaches since the operations on the frontal sinus, both under cocaine anæsthesia. Since the operation slight curettage of sinus, lavage and injection of collusol argentum. The 6 mm. bougie entered and withdrawn several times during the meeting.

The patient can pass a frontal sinus cannula and lavage himself.

(II) Introductory Paper by Herbert Tilley, F.R.C.S.

ACUTE EMPYEMA OF THE FRONTAL SINUS.

There will be little difference of opinion amongst us as to principles which should be followed in the treatment of acute suppuration in the frontal sinus. We know that the vast majority of cases get well without any local treatment and that this happy result is due to the fact that the anatomical disposition of the sinus is such that efficient drainage of the inflammatory products is provided for in an ideal manner—i.e., from the lowest point of the inflamed abscess cavity. When conditions are present which impede such drainage, symptoms of retention will appear and our efforts will be directed to the establishment of a free outflow from the sinus.

Amongst the factors which commonly lead to retention of inflammatory products we may mention:—

(*a*) Great swelling of the mucous membrane of the nasal cavity, which is shared by that of the fronto-nasal duct and of the mucous membrane lining the middle meatus, which in this situation may be in the nature of acute œdema—a fact due to the loose subepithelial tissue in the concavity of the middle turbinal. Such acute congestion is often seen when the inflammation is due to influenza infection.

(*b*) An abnormal swelling of the anterior end of the middle turbinal which is wedged in between the septum and the anterior region of the lateral mass of the ethmoid, wherein is situated the lower end of the fronto-nasal canal.

(*c*) A deviation of the upper part of the nasal septum by pressing outwards an otherwise normal middle turbinal will induce a similar result.

(*d*) The obstruction may be found in the fronto-nasal canal itself in the form of an anterior ethmoidal cell which, extending upwards, encroaches on the floor of the frontal sinus and makes a serious inroad on the patency of the fronto-nasal canal. Such a cell is known as the "frontal bulla."

These do not exhaust the conditions which may obstruct free drainage, but they are amongst the commonest factors.

Our treatment must be directed to the establishment of free and spontaneous drainage. To this end the patient should be kept in bed in a warm room, and drainage will be promoted if the head and shoulders are slightly raised on a pillow. The bowels should be opened by 2 to 3 grm. of calomel and followed by a saline aperient. After the initial action, I think $\frac{1}{6}$ gr. of calomel every two hours for the first three days is a useful treatment; 10 to 15-gr. doses of aspirin three or four times daily is probably the best internal remedy when influenza or an acute coryza is the underlying constitutional disease. To relieve congestion of the mucosa in the region of the middle meatus we must rely on the application of cocaine and adrenalin. Equal parts of a 20 per cent. solution of the former and a 1 in 1,000 solution of adrenalin chloride will be found of sufficient strength, and it should be carefully applied on a wool mop every two hours for the first day or two, or until the symptoms of retention show signs of subsidence. If care be taken only to apply small quantities to the anterior part of the middle meatus there need be little fear of cocaine poisoning. Scarification of the anterior end of the middle turbinal with its attendant blood-letting is excellent practice in cases where the mucous membranes are very much swollen. An attempt should be always made to pass a fine cannula into the sinus and wash out any inflammatory products with warm normal saline solution of boracic lotion. Last year I was able to do this in a child aged 9 with great relief to the supra-orbital pain, and the irrigation was followed by a rapid fall of temperature from 102° to 99·6° F.

When a case admits of irrigation the cure is usually rapid and complete. On the other hand, when acute symptoms of retention persist and it is difficult or impossible to make applications of the cocaine mixture (*vide supra*) to the middle meatus because of enlargement of the middle turbinal, this structure should be removed together with any obstructing anterior ethmoidal cells, and the aforementioned treatment carried out. I have seen œdema of the upper eyelid associated with acute tenderness of the anterior wall of the sinus completely subside after removal of the middle turbinal and application of cocaine and adrenalin to the anterior region of the middle meatus.

I have not had much experience of Sondermann's suction apparatus in the treatment of acute sinus inflammation, but it may be tried, or, failing it, an efficient exhaust may be made by means of a Politzer's bag.

I have never used a Brünings's light head-bath for the head, but have found great relief from hot fomentations applied over the lower forehead.

When acute symptoms persist in spite of the above measures, and especially when swelling and œdema appear in the eyelid and in the soft tissues over the sinus, external operation will be called for.

CHRONIC EMPYEMA OF THE SINUS.

The history of the surgery of the frontal sinus has proved to be no exception of the rule which has marked the progress of most surgical discoveries and innovations. First comes the discovery of a new area, with its associated pathological conditions previously unrecognized or little understood, and with this clearer recognition there is gained the clue to symptoms and clinical signs hitherto unintelligible or misinterpreted. Radical measures are adopted, and very soon a series of successful cases are reported by the pioneers in this new territory of human frailty. An inrush of enthusiastic workers follows, and claims are pegged out in the name of this or that surgeon who devises an operation, or more often modifies that of his fellow-worker. The pace is fast and furious, but soon the inevitable fatal cases occur, or the after-results are not all that was promised or desired, and by mutual consent a halt is called, breathing time is asked for, and we look around to take stock of our position. During this pause there are those who wonder if, after all, it is not possible to secure the well-being and happiness of the patients by measures which shall entail less suffering and less risk to life, as well as a diminution of anxiety on the part of the surgeon.

I take it, sir, that this is our position to-day, that we meet to discuss whether it is not possible in this day of fuller knowledge and riper experience "to make the punishment fit the crime," and I regard it as a great compliment that the Council has asked me—I fear one of the radical pioneers in the surgery of the frontal sinus—to share in opening the discussion to-day.

ANATOMICAL CONSIDERATIONS.

There must be few regions in the body where the difference between the success or failure of surgical interference, or indeed the very life of the patient, depends on a more intimate and practical knowledge of anatomy than it does in the region of the ethmoid bone, which borders so closely on important and vital structures. For this reason I propose to point out the main anatomical features met with in the region of the anterior ethmoidal labyrinth and its relation to the frontal sinus, the cribriform plate and the orbit. These relationships will be demonstrated by photographs which have been taken from specimens prepared by myself, and from illustrations selected from the works of Logan Turner, Beaman Douglass, Mosher, Onodi, and others. To Mosher, of Boston, U.S.A., I am especially indebted, and would refer you to his excelient monograph.[1]

The superficial features of the outer wall of the nasal fossa are familiar to you all—viz., the superior, middle and inferior turbinal bodies. If the middle turbinal is removed, two structures immediately call for notice (fig. 1):—

(1) The ethmoidal bulla, the largest of the anterior ethmoid cells; its lower border lies in the concavity of the hiatus semilunaris.

(2) The hiatus semilunaris, a curvilinear depression bounded above by the ethmoidal bulla and below by the edge of the uncinate process of the ethmoid.

The hiatus is the communication between the middle meatus and the "infundibulum." The infundibulum is the curved gutter-like channel on the outer wall of the middle meatus bounded above by the bulla ethmoidalis, and below and internally by the outer surface of the uncinate process. It may terminate anteriorly and superiorly in one of two ways: (*a*) By ending blindly in an ethmoidal cell; (*b*) by being continued upwards into the fronto-nasal duct. The "fronto-nasal duct" is the canal or passage which leads from the infundibulum or from the middle meatus into the frontal sinus.

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[1] "The Applied Anatomy and the Intranasal Surgery of the Ethmoidal Labyrinth," *Laryngoscope*, St. Louis, 1913, xxxiii, pp. 881-907.

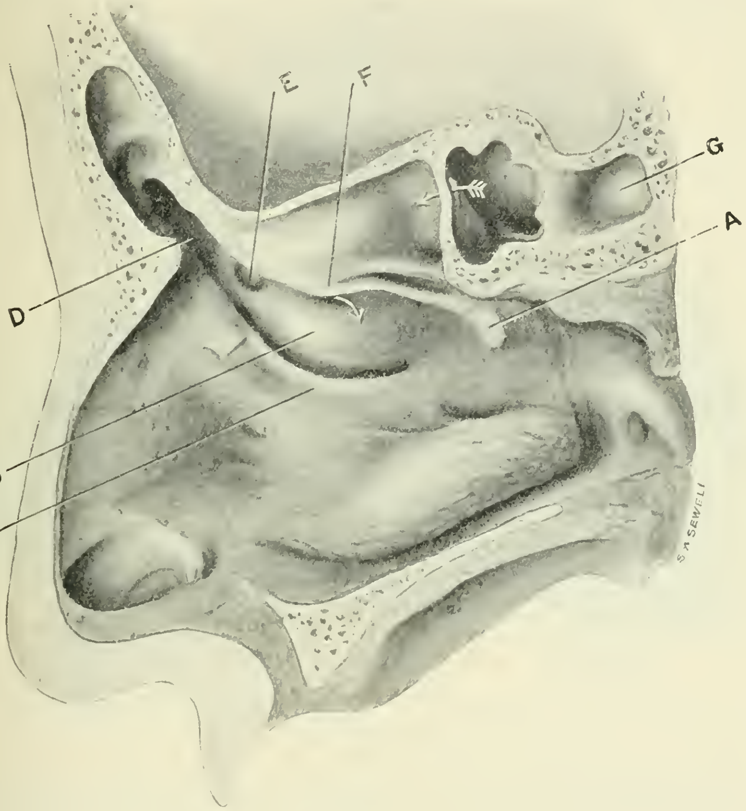

FIG. 1.

A, posterior cut end of middle turbinal; B, ethmoidal bulla; C, uncinate process of ethmoid; D, frontal sinus; E, opening of an anterior ethmoidal cell; F, opening of ethmoidal bulla; G, extension of left sphenoidal sinus behind right sinus. (From specimen dissected by author.)

Mosher says that in 25 per cent. of the skulls he examined the fronto-nasal canal was continuous with the infundibulum, while in 50 per cent. it opened freely—i.e., independently of the infundibulum—into the middle meatus.

You are aware that the cells composing the ethmoidal labyrinth are divided into an anterior and posterior group by a thin, diagonally placed plate of bone which, externally, is limited by the os planum of the ethmoid and, internally, projects into the nasal cavity, and forms the middle turbinal body. Each true cell has an opening of its own, and those cells which belong to the anterior group open into the middle meatus, while those of the posterior group open into the superior meatus.

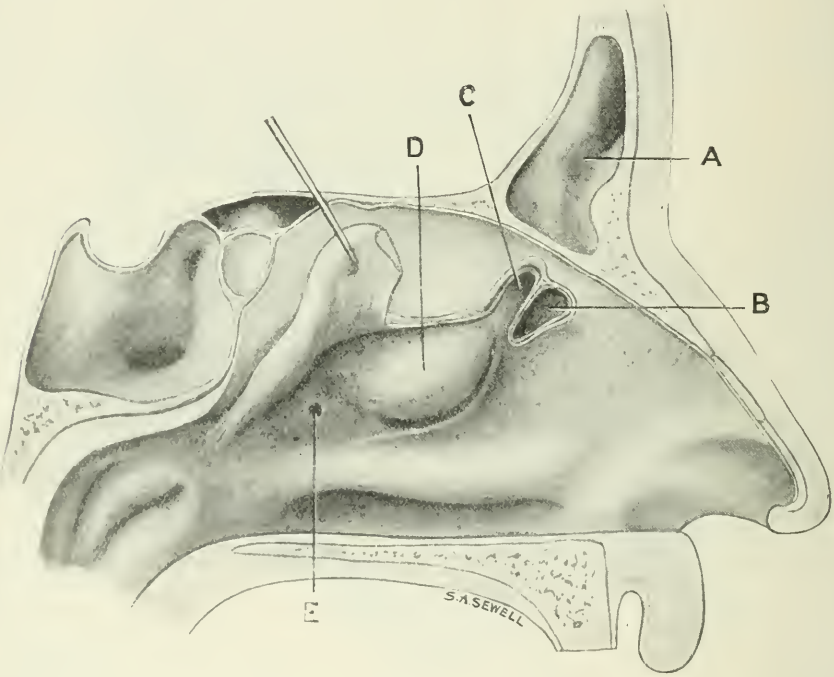

Fig. 2.

A, frontal sinus; B, "agger cell"; C, frontal-nasal canal; D, large ethmoidal bulla; E, accessory antral "ostium." (From specimen dissected by author.)

The cells in each group vary in number, and we may not be far wrong if we say that the anterior may number from three to seven, and the posterior from one to four. As a rule the anterior cells are smaller than the posterior, and their openings are in the region of the hiatus semilunaris and infundibulum.

May I remind you of the great variations which may be met with in the size, structure and situation of the ethmoidal cells? It will only be necessary to refer to the most important of them.

(1) The "bulla frontalis" is an anterior ethmoidal cell which projects upwards and anteriorly into the floor of the frontal sinus and is a frequent cause of obstruction to the catheterization of the frontal sinus. Sometimes these cells are found in front and to the inside of the frontal nasal duct and end beneath the intersinus septum, thus producing a bulging outwards of the lower part of the septum.

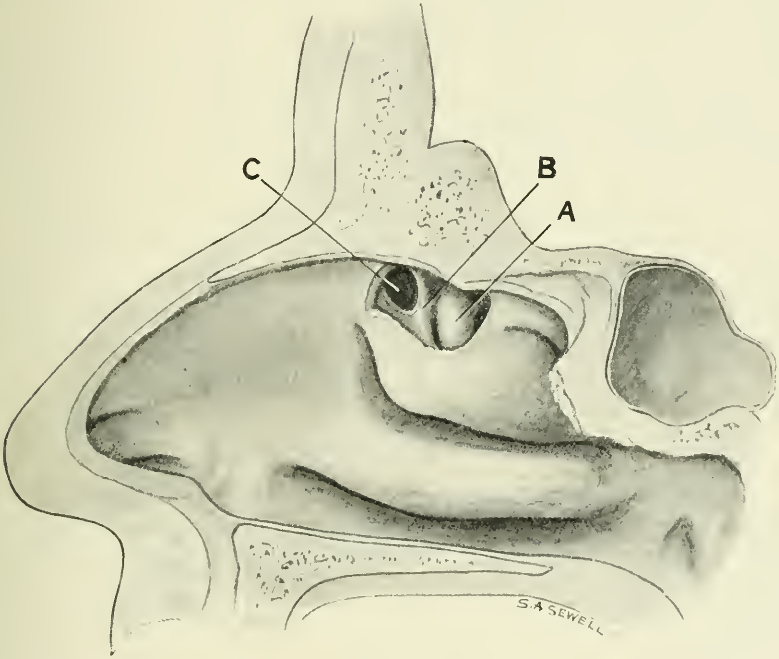

FIG. 3.

A, upper portion of ethmoidal bulla; B, upper end of uncinate process; C, "agger" cell. (From specimen dissected by author.)

(2) The "cell of the agger nasi" is a cell (sometimes two or three) often developed in the anterior and upper third of the uncinate process, and frequently proves the main obstacle to probing the frontal sinus (fig. 2, B). We are indebted to Mosher for pointing out the importance of removing this cell in order to gain free access to the frontal sinus and to the anterior cells of the lateral mass. This agger cell "is covered by the anterior attachment to the middle turbinal

where this bridges across the upper part of the unciform groove" (fig. 3, C) (Mosher, loc. cit.).

(3) Fronto-ethmoidal cells, which extend outwards for a varying distance between the roof of the orbit and the frontal sinus, and the presence of such cells must militate against a cure of suppuration by any intranasal operation.

(4 and 5) It is unnecessary to do more than mention the presence of maxillo-ethmoidal and spheno-ethmoidal cells, because they scarcely come within the purview of this discussion.

The "ostium" of the frontal sinus is a narrow communication of the frontal sinus with either (*a*) the nose directly, when it opens in the upper anterior portion of the middle meatus; (*b*) the upper end of the fronto-nasal duct opening into the infundibulum. Its normal position is below the level of the cribriform plate, and it may be displaced mesially towards the cribriform plate, laterally towards the orbital plate of the frontal bone, anteriorly towards the nasion, or so far posteriorly that it is close to the posterior wall of the frontal sinus.[1] Danger would be encountered in the intranasal operation if the ostium is small, situated near the sagittal plane and at a higher level than the cribriform plate.

GENERAL CONSIDERATIONS.

It is obvious that if the intranasal method of treating chronic frontal empyema is to partially supplant the external operation it must conform to certain elementary principles which underlie the treatment of similar conditions in other bony-walled cavities. Briefly, these principles are:—

(1) Provision must be made for free, spontaneous, and permanent drainage.

(2) The removal of pyogenic membrane and foci of infection.

(3) The establishment of a non-suppurative lining mucous membrane or the complete obliteration of the bony cavity by organized granulation tissue.

(4) Finally, the intranasal method must possess advantages over the external operation and show equally good or even better results in those cases where there is a choice as to which method can be employed.

Guided by the principles just enunciated, it will be clear that only a certain percentage of cases treated by the intranasal method will be curable. If the frontal sinus is of moderate size, free from bony septa which divide it into almost separate chambers, and the fronto-nasal canal permits of enlargement so that free and permanent drainage can be secured, then we may look for success, even to the establishment of a cure. If these desiderata are absent, then, while the intranasal operation may induce marked relief of symptoms, only the external operation will give the chance of a cure. I use the word "chance" purposely, because even when the sinus is fully exposed from the outside by the Killian or any other operation, we know that a complete cessation of discharge with obliteration of the cavity is sometimes almost impossible of attainment, especially in those instances where the depth of the sinus from before backwards is abnormally great.

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[1] Gordon Wilson, *Trans. Amer. Laryng. Assoc.*, New York, 1908, p. 178.

What, then, are the conditions which would lead us to favour the intranasal method of operation?

(1) When the sinus is capable of being entered by a suitably curved probe or cannula. And here I would say that, generally speaking, a diseased sinus is easier to enter than a normal one.

(2) When the sinus is not subdivided by septa into practically a series of almost separate bony-walled cavities.

This information can only be gained beforehand by a good skiagram, and this method of examination must never be omitted either in the intra- or extra-nasal operation, for the information it will give us may be invaluable in many ways. Granted the favourable conditions referred to, I do not think that the chronicity of the case, or the extent of pyogenic membrane present, need militate against our choice of the intranasal method, because if free drainage can be secured by enlarging the fronto-nasal duct we can destroy a great part of the unhealthy membrane by methods to which I shall refer presently.

What conditions should influence us in selecting the external method?

(1) A narrow, tortuous, fronto-nasal duct which will not permit the passage of a probe. This condition becomes less frequent with increased experience in intranasal manipulation and knowledge of anatomical detail. The narrow, tortuous duct is often due to a large cell or cells in the upper anterior end of the uncinate process—the so-called "agger" cells—and these are easy to remove, as Mosher has shown, and I can heartily endorse his assertion that by such a removal a fronto-nasal duct hitherto impassable may be easily traversed by a full-sized probe. The specimens shown demonstrate this point very well.

(2) When the posterior wall of the frontal sinus is so low as closely to overhang the ostium of the sinus any force used in trying to enter the sinus cavity might easily set up an infective meningitis. Possibly the fatal cases published some years ago by Schäfer, Mermod, and others belonged to this category. A profile skiagram might give invaluable information in such a case, and if there was any doubt about it the probe should be passed under the guidance of the Röntgen ray.

(3) Those cases would be especially dangerous where the "ostium" of the sinus is situated above the level of the cribriform plate, and still more so when, in addition, the ostium is close to the sagittal plane.[1]

(4) The external operation would be necessary in the presence of an external fistula, of ocular or meningeal symptoms, or if severe symptoms continue after the intranasal operation.

One great point in favour of the preliminary intranasal operation is that by means of it we are enabled to remove practically all the obstruction in the nasal cavity below the level of the ostium of the sinus, and this applies to septal deformities as well as ethmoidal obstruction, whether the latter be diseased or in a normal condition. Hence, even if an external operation be later on advisable, one essential point in its success has already been attained, for everybody will agree that free intranasal drainage is the chief desideratum of all external operations on the frontal sinus.

THE INTRANASAL OPERATION FOR THE RELIEF OR CURE OF CHRONIC INFLAMMATION OF THE FRONTAL SINUS.

In the following brief description I shall assume that the disease is of long standing, that the lining membrane has undergone extensive polypoid degeneration, and that the anterior ethmoid cells are in a condition of chronic inflammation which shows itself by the presence of numerous polypi or polypoid buds, and that when the cells are examined by a probe they give evidence of undue friability owing to rarefying osteitis. I shall also assume that it is possible to catheterize the sinus through the fronto-nasal canal, and that a frontal and lateral skiagram show that the conformation of the sinus does not contra-indicate treatment by the intranasal method.

Three-quarters of an hour before the administration of the general anaesthetic a hypodermic injection of morphia $\frac{1}{6}$ gr. and atropine $\frac{1}{100}$ gr.

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[1] G. Wilson, *Trans. Amer. Laryng. Assoc.*, 1908.

is administered. This will check undue secretion of mucus in the nasal cavity. Half an hour before the operation the frontal sinus should be thoroughly washed out with normal saline solution to which a little peroxide of hydrogen solution is added. The maxillary antrum should also be irrigated if it acts as a reservoir or generator of pus. I attach great importance to this preliminary cleansing as a means of avoiding post-operative septic contamination. Finally, a small swab of gauze soaked in equal parts of a 20 per cent. solution of cocaine and adrenalin chloride should be applied to the middle meatus and middle turbinal regions. When the patient is anæsthetized and lying on his back with the head slightly raised on a pillow, I remove the middle turbinal bone by means of scissors and snare. Any little bleeding can be readily checked by the application of gauze moistened with peroxide of hydrogen solution. One next endeavours to enter the anterior ethmoidal cell region, to remove this thoroughly, and in doing so to destroy the fronto-nasal canal and gain as close and as free access to the frontal sinus as is possible without running undue risks. The anterior ethmoid cells can be best entered opposite and external to the anterior attachment of the middle turbinal (fig. 4). For this purpose a small mastoid gouge on a long shank is very useful. Pressure outwards and slightly backwards will easily break into the anterior cells and the instrument continues in this direction till it meets the lachrymal bone. Its presence in this region can easily be detected by the surgeon placing a disengaged finger over the region of the internal canthus. The cutting edge of the instrument should now be directed downwards, and with a little gentle pressure the "bulla" and lower anterior cells may be destroyed and semi-detached fragments removed with special forceps. Externally the excursion of the curette will be limited by the lachrymal bone and the os planum of the ethmoid, anteriorly by the hard posterior edge of the ascending process of the superior maxillary bone. Posteriorly it will be possible to enter the posterior group of cells and even the sphenoidal sinus, if the conditions present demand the destruction of all the ethmoidal cells.

Having thus destroyed the anterior group of ethmoid cells, including the agger cells when present and the fronto-nasal canal, it should now be easy to pass a probe into the frontal sinus. Finally, an effort should be made to enlarge the "ostium" of the sinus, so as to provide free drainage into the nasal cavity (fig. 5).

I have already shown at this Section a burr constructed for this purpose and it has served me excellently. The instrument is constructed as to curves on the plan of most frontal sinus probes and the distal end is thickened and roughened for ⅜ in., but only on its anterior and lateral surfaces; the end and posterior surface are flat and smooth, so that it is almost impossible to injure the posterior wall of the sinus if it should lie close above the ostium. The burr is made in two sizes and the smaller is passed first. When it enters and is engaged in the upper end of the fronto-nasal duct or the ostium, it is drawn downwards and forwards with a little pressure of the upper end outwards. By this means the ostium may be considerably enlarged, especially if a frontal bulla is present. In using this or any other instrument in this region, the surgeon must bear in mind that it will be safer, and he will meet with less resistance, if he enlarges the ostium by destroying the outer half of its circumference rather than the inner, which may be in close proximity with the cribriform plate.

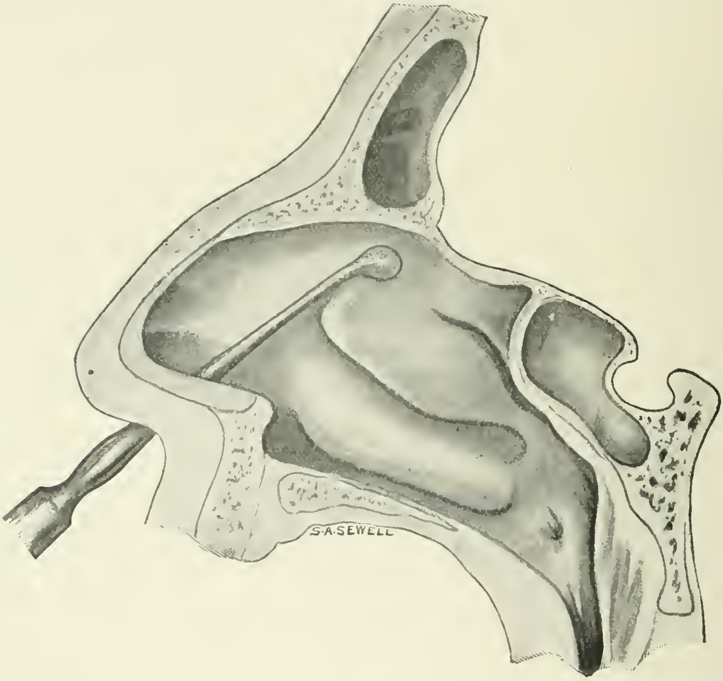

FIG. 4.

Indicates the site where access is gained to the anterior group of ethmoidal cells.

Having made as free a communication with the nasal cavity as is possible, the operation is finished, and all that is necessary is to place a small piece of cotton-wool in the nostril, which should be constantly replaced as soon as it becomes soiled. This protective measure should be carried out for a week. After forty-eight hours the nasal cavity should be sprayed with a 5 per cent. solution of cocaine and then cleared by means of a warm, alkaline, coarse spray to which some peroxide of hydrogen solution has been added and the frontal sinus irrigated through a cannula with the same solution. This treatment should be carried out daily for a week or ten days or until the discharge from the frontal sinus has ceased or shows signs of doing so. Any tendency to the growth of exuberant granulations in the ethmoidal region, and more especially around the opening into the frontal sinus, can be checked by the application of nitrate of silver.

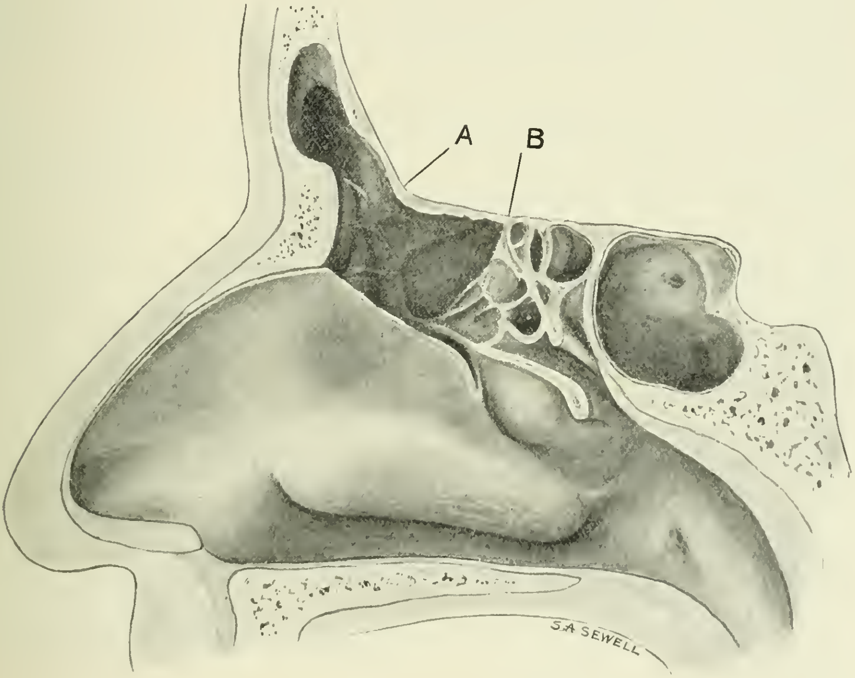

Fig. 5.

A, B, area included between these lines indicates the ethmoidal region when the anterior group of cells have been removed. (From specimen dissected by author.)

If the discharge from the frontal sinus does not show signs of ceasing in a week or ten days, it is good treatment to cleanse it as thoroughly as possible (*vide supra*), dry it out by the insufflation of warm air, and then inject a solution of silver nitrate, 60 gr. to the ounce. This will destroy the greater part of the villous outgrowth of the pyogenic membrane and permit the regrowth of a more normal lining membrane.

I have been practising this operation for the past three years, and so far I have had no fatality. My results have been more satisfactory since Mosher pointed out the importance of the "agger" cell at the meeting of the British Medical Association in Liverpool in 1912, and I do not think we can overestimate the practical importance of his observations.

For two years I have not performed either in hospital or private any external operation on the frontal sinus for chronic empyema, but I have done at least thirty intranasal operations. If I am asked, "Have you cured them all?" my reply will be, "Certainly not," if it is meant by the term "cure" a total absence of any purulent or muco-purulent discharge from the sinus. Some of them, however, are cured even when judged by this severe test, but most of the remainder have been relieved of headache and other subjective symptoms, while the amount of discharge has been so reduced as to be almost a negligible quantity. And here let me say that I have had the opportunity of seeing from time to time during the past twenty years patients with frontal or other sinus suppurations, some of whom have had temporizing operations performed, while others refused any operation at all upon the affected sinuses, and yet to-day they seem in perfect health, and only suffer from the slight inconvenience of the discharge, for which they originally consulted me, and in many cases were probably advised to undergo the radical external operations.

Three weeks ago a patient came to see me whom I first saw fifteen years ago for nasal polypi and bilateral pansinusitis. I then discussed with him the radical external operation on both frontal sinuses, but he decided against any intervention, as it was only the inconvenience of the discharge for which he consulted me. On the occasion of his recent visit he reminded me of my earlier and radical suggestions, and when I looked at him, standing as he did 6 ft. 3 in. in height, weighing 16 st., the picture of health and strength, and when he added, "I have never had a headache in my life," it seemed to me that we have yet a lot to learn about the protective agencies which Nature manufactures in the laboratory of the human body, that we must not always regard a purulent nasal discharge as a grave condition leading necessarily to the formation of gastric ulceration, septic pneumonia, intestinal toxæmia, and other possible evils. And when I review my own experiences and think of those recorded by others (such, for example, as are to be read in a paper by Dr. Ross Skillern in the *Laryngoscope*, 1913, xxiii, p. 1063, "Untoward Results following the External Operation on the Frontal Sinus: a Critical Review of Twenty Cases") one cannot escape the conclusion that more patients have died or suffered as a result of the external operation than from the untreated disease. And, furthermore, when we look back upon our most successful cases in which the scar is almost invisible, and the intranasal discharge has quite ceased, and bear in mind the tedious and often painful after-treatment, the prolonged convalescence, and the occasional periods of anxiety which the treatment involved—have we not sometimes asked ourselves, "Was it really worth while?"

To-day's discussion may point an easier way for at least some of our patients—and I am grateful to the Council for inviting me to state in what way and for what reasons my enthusiasm for the external operation has been so tempered by experience, so that when it is possible I prefer to adopt the intranasal method.

In conclusion, I wish to acknowledge my obligation to the works of Ingals, Spiess, Halle and Good, as well as to those whose names have already been mentioned.

Note.—Five patients were shown in whom the intranasal operation had been carried out—one of them in 1911. Skiagrams, drawings illustrating the above described anatomical features, dissected specimens, and instruments used for the operation were also demonstrated.

DISCUSSION.[1]

Sir StClair Thomson desired to add his congratulations on the very excellent papers with which the discussion had been opened, the epidiascope illustrations enabling members to know what was being done, and how it was being carried out. These papers would provide a new standard, just as did the work of Luc and Killian in reference to the external operation. Man was a rather conservative animal, as he was reminded by a remark by Dr. Watson-Williams that it went without saying that all these researches on the frontal sinus should be confirmed by X-rays. It seemed to him only the other day that he (the speaker) presented some radiographs to the old Society, to show that no one could be positive that a probe or cannula was in the frontal sinus for the first time, unless it was confirmed by the radiograph. He thought the point should be brought before the Committee of every special hospital, so that it could be provided with an X-ray apparatus. Some of the photographs exhibited in the next room showed that Dr. Watson-Williams had not reached the frontal sinus, but those cells which he (the speaker) many years ago called the orbito-ethmoidal cells, a term which had since been adopted, and was expressive. He was reminded of a remark attributed to Charles Lamb, that whenever a new book came out, he always read an old one! When these new operations were brought forward he (the speaker) turned his thoughts to former external work on the frontal sinus. He confessed that he would feel much less nervous to-morrow in operating on a frontal sinus by the external method than by blindly using a burr or similar instruments inside the sinus itself. Perhaps that feeling might change with experience. The last time he was in Paris he asked Dr. Luc if he always thought it his duty to tell every patient he was about to operate upon that the external operation was a very serious one, and his reply was that he did not think it necessary since he had adopted the complete Killian method, for he thought it no more risky than any operation on a septic nose. He was also recently in Berlin, and found that Professor Killian now did fewer external operations on the frontal sinus, and in a clinic of some 15,000 new cases every year he only used the external method in six to ten cases. Killian had also been studying the internal route. Four weeks ago he saw the operation done by Max Halle, which had been so well described by Dr. Watson-Williams. Halle turned down a flap, and chiselled away part of the ascending process of the superior maxilla, so as to get at Mosher's agger cells. These he broke down sufficiently to pass Ritter's probes. Having done that, he came to what he (the speaker) regarded as the alarming part of the performance; he took the last of the three sizes of burr shown by Dr. Watson-Williams, and got it into the sinus before making it rotate, and he rotated it as he brought it out, and in that way he claimed to get down the crista nasalis. The skull he would now pass round showed that we must be eclectic, because this method could not succeed in every case, owing to the anatomical diversities in the human body, and these were so common that the operator must be prepared for disappointments. Into the orbito-ethmoidal cell of the skull he had passed some black worsted. The cell could be seen to spread over the top of the orbit, and there was no communication between it and the frontal sinus. One might operate on the sinus successfully, without relieving the patient of much nasal suppuration, and possibly headache, from not knowing that there was this configuration, whereas when operating by the external method one was more likely to expose it. He asked members to note the very narrow fronto-nasal duct, and see the dangers that would be run from putting a rotating burr through it.

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[1] Dr. William Hill, Vice-President of the Section, here took the Chair.

In Berlin he noticed that surgeons were, on the slightest provocation, resecting the septum. They did a septum resection with as little compunction as one would shave a patient before operation, and the results seemed satisfactory and harmless.

Coming to results, there could be no doubt that this internal route had a great future, particularly in women, who, quite naturally, would not consent to external defacement. But there would always remain the possibility of reinfection, and therefore the important question arose, Was it safer? Junior members might think it was safer; his own feeling was that he had now little hesitation in recommending the external operation, although disasters would come at odd times, and he had published his—all in pioneer days. Luc had several disasters at first, but he had not now had any for a long time; neither had Mr. Tilley, nor he (the speaker). Still, he often quoted Killian's experience: he operated eighty-six times on the frontal sinus without a fatality, but before reaching his hundredth case he had had three deaths, one of which was from dammed-up pus in an undiagnosed sphenoidal sinus—another plea for making a very complete diagnosis before starting to operate. He agreed with Mr. Tilley that the father of this route was Mosher; it was attention to the agger nasi cells which made the route possible. Those who were thinking of this operation should limit their attentions at first to the approach to the frontal sinus.

Dr. DAN McKENZIE said the very able papers contributed by Dr. Watson-Williams and Mr. Tilley were made all the more useful by the lucid way in which the operation had been described by means of the epidiascope. But perhaps the whole problem had not been dealt with in the manner in which it was troubling some minds. It was very necessary to settle in what type of case the internal operation should be done, and when the external should be chosen. He, with the last speaker, would use caution before adopting the internal operation, which he thought was regarded by many as secondary in safety and in position. The swing of the pendulum in favour of radical operation three years ago was now at the opposite extreme, and there was too much tendency to operate intranasally. One could not contemplate the pictures shown to-day without feeling that there were some cases in which the internal operation would be very perilous to the patient, and he knew of no method—not even X-ray examination—by which one could be quite certain of the anatomy before operating. If the intranasal operation were adopted in a general and enthusiastic manner, he felt convinced that many cases of disaster would be encountered. Certainly operating by this route should be done with the eyes wide open to its risks and dangers.

Dr. E. A. PETERS said he had shown two cases operated upon by the method, and he did not doubt that, from the patient's and from the surgical point of view, there was much to recommend it over the external operation, but there were some points which he was not clear about. In another case operated upon on the previous Wednesday one side which had discharged spicules of bone was dealt with by the external, and the other by the internal method. On the first side the mucous membrane was polypoid, and he wondered if such a condition could subside when the intranasal operation route was chosen. With regard to the probe which was used, both before the cutting operation was commenced and during the operation, to locate the position of the canal, it was useful to have its last eighth of an inch rather sharply bent. In a very narrow nose he obtained an excellent approach by cutting vertically through the septum, and working from the other side; he could then see into the cells, especially by using a Hartmann's speculum. The patients he showed were operated upon by a procedure which occupied only twenty minutes. He first cut off the anterior edge of the middle turbinal by small Luc's forceps, and then followed a probe. In a short time he could pass a Good's raspatory, and then cut downwards through the agger cells if present. It was necessary to avoid using much pressure, and to do the cutting from above downwards and outwards. He did not think the method would be so good when polypi and carious bone were present.

Mr. J. P. I. HARTY (introduced by Dr. Watson-Williams) said he had performed the operation just described in Dr. Watson-Williams's clinic, and he had been very pleased with it, and with the ease with which it was done. In most of the cases he had done it under local anæsthesia. The entry was easily made, and the washing-out was easy, but the difficulty was as to when the suppuration would stop. In some cases which he had kept under observation the suppuration had persisted for some months, though the headache and other symptoms had been relieved.

Dr. DONELAN said he had just been asked how many cases of chronic frontal sinus suppuration really needed operation. For his part he thought he did not see more than about twenty-five of such in a year, and many of them were perambulatory cases going to various hospitals. In chronic frontal suppuration he thought we had all been carrying out for years the most legitimate internal treatment. We had all removed the anterior end of the middle turbinal, and if we did not distinctly recognize the anatomical importance of the agger cells, if such really exist, one went through them with the forceps, and cleared upwards and outwards through the ethmoid as far as possible. Where this had not sufficed, he had always opened the inner end of the frontal sinus by an external incision. The ingenious drills shown on this occasion were all for the purpose of removing in more or less dangerous ways the obstruction caused by the nasal crest. He thought it could be much more safely removed by means of a curved chisel externally, and the advantage on the score of safety was so great that he thought this method was superior to any other. He must admit that in the great majority of the cases so operated on by him, on inspection of the cavity and the use of a flexible probe through the small opening, it was decided to undertake the obliteration of the sinus. It was unnecessary to insist on the importance of this direct examination of the interior. Mr. Tilley had himself admitted in his paper that even when one had succeeded in entering the cavity by an exclusively internal route, the operator did not know where he was, pathologically speaking, for one could not know what was taking place round the corner. He could refer to only very few cases that really needed operation in which this combined method had been successful, and he was of opinion that if what he called the legitimate internal treatment were not successful, and the patient continued to complain of pain, the radical external operation should be performed.

Mr. Hope said that a short time ago Sir StClair Thomson and he examined some specimens of skulls, and he was sure that in some of them there was not more than 4 mm. of safety in the region where Dr. Watson-Williams said there was usually a space of 9 mm.; hence there would have been danger if this operation were done in such cases. He asked what means there was for determining the depth of the sinus.

Mr. Howarth agreed as to the need of the surgeon having, in order to do this operation, a clear grasp of the anatomy of this region. That had been placed on a more satisfactory footing by the paper of Dr. Mosher, and his own examination of many skulls and post-mortem preparations had brought him to the same general conclusion as to the opening of the fronto-nasal duct and its relationship to the ethmoidal cells. Since Mosher published his paper that authority had come to the opinion that the "agger nasi" cells were not present so frequently as he was at first led to suppose. It seemed to the speaker that one reason why Mosher's point of entry was a good one was that it was above the region of the agger nasi, and the ethmoid was entered by going through the middle turbinate itself. He believed that Mosher did not now lay particular stress on the preservation of the middle turbinate. He (the speaker) did not think that the internal operation could be applicable to all cases because of the varying anatomical configuration of the fronto-nasal duct. In those cases where the frontal sinus was developed from the third frontal groove in the frontal recess, the fronto-nasal duct was placed external to the infundibulum and opened into it obliquely. He had seen specimens where the fronto-nasal duct had been going down external to the whole ethmoid labyrinth, and it could not be safe to approach these by the internal method. The operation certainly had a great future, but he agreed with Dr. McKenzie that it would be necessary to choose with care the patients for submission to it. As regards his own procedure, he had not as yet been courageous enough to use the burr or raspatory to remove the nasal crest, but had followed Mosher's procedure and worked rather from behind forward. He thought that this gave a better approach to the ethmoid than the anterior method, as in the latter, unless agger cells were present, one was apt to come up against the ascending process of the superior maxilla, and did not readily enter the ethmoid labyrinth, and to enter the frontal sinus one must often burr off the nasal crest. By going in farther up one was more liable to enter the ethmoid labyrinth, and so get at the fronto-nasal duct. He thought that one reason the operation was so successful was that in approaching the frontal sinus coexisting ethmoiditis had to be dealt with.

Mr. W. STUART-LOW said he had listened with great interest and instruction to the addresses and demonstrations. He agreed with Mr. Tilley that whether this operation was accepted by surgeons or not largely turned on the anatomy. In studying for the Fellowship of the College of Surgeons one must understand the vagaries of blood-vessels, but, in the future, if such operations as those here suggested ever became common, all candidates for this distinction would have to be familiar with all irregularities of the bony cells of the nasal labyrinth. On the score of anatomy alone he had no hesitation in rejecting such procedure as this operation as unsurgical; it was impossible to know the exact anatomy, and the variations of these parts were so great that to do as suggested and push burrs and bougies about in this region was, in his opinion, reprehensible. He had shown many successful cases at this Society where a combined operation had been performed, the intranasal preparation for the Ogston's external method first being done, the middle turbinal being entirely removed, and thus free drainage from below established as a preliminary to the Ogston operation. By the external operation every step could be observed and the sinus thoroughly cleared of polypi, and a thickened pyogenic lining scraped away. He agreed with Dr. Peters in considering that it would be impossible to remove polypi through a small opening into the nose from below, as suggested in this new method. The new operation reminded him of the now extinct operation, vaginal hysterectomy, which was the cause of so many deaths before it was given up. He would not adopt what he would characterize as blindfold surgery.

Dr. CATHCART considered the present meeting an epoch-making one in the Society, as it was held for the discussion of an operation, which had been done a good deal on the Continent and in America, and of which the pioneers in this country were Dr. Watson-Williams and Mr. Tilley. As a rule, a new method of operation is suggested in order to obviate the dangers of the old one, and it must be remembered that the introducers of this discussion were also pioneers of the old operation; hence it was not likely they would take up with the new, the intranasal, operation unless they felt there was less danger from it than from the old one. The attitude of Dr. Dan McKenzie was well illustrated in the seventeenth century, when in Paris there was a celebrated friar who cut for stone so successfully that the Paris surgeons had him educated in anatomy. This taught him the dangerous region he had cut into, with the result that he was afraid to operate again. If operators were only to have in mind all the supposed dangers, no new operation would be devised or done. He had seen Dr. Watson-Williams operate, and what struck him was that the operation was done by the feel of the end of the forceps. In fact, in one case the septum was so deflected that it was not possible to see the middle turbinate bone. In the olden days the operation on the maxillary antrum was always done from the outside, because it was said the operator must see what was going on. It was now far more often done from the inside, and the success was no less great. The chief point to be emphasized was that each one, before trying the intranasal operation, should practise it on the cadaver. Anatomical variations were as likely to be met with in the intranasal as in the extranasal operation.

Dr. FITZGERALD POWELL desired to thank Dr. Watson-Williams and Mr. Tilley for their very interesting papers and demonstrations, which drew marked attention to a very important phase in the treatment of "frontal sinusitis." He had listened with great interest to the opinions evoked by the discussion, and had come to the conclusion that he, in common with the rest of the Section, had so little practical experience of the methods advocated as to make these opinions of little value when opposed to the experience of the two gentlemen whose papers they had read and to whose remarks they had listened with so much interest. For his part, he would certainly keep an open mind, and would not form conclusions as to the utility and dangers of the operation until his experience warranted it. In the past Mr. Tilley had been a strong supporter of the external radical operation, and he (Dr. Fitzgerald Powell) had learned a good deal about frontal sinus treatment from him, and had seen a number of Mr. Tilley's cases which had been treated by the external method, and had been successful, and he could not quite understand Mr. Tilley's statement that for two years he had not treated a single case by the external method.

Dr. Watson-Williams, in his excellent work on "Rhinology," published in 1910, expressed himself as strongly opposed to the internasal method, which he now advocated—going as far as to say that, even if there was no danger in this operation, it was not as good a one as the external operation—and he could only conclude that with more experience of the "internasal" operation he had changed his opinion in regard to it. Consequently, he would advise the members, with Dr. Watson-Williams's experience before them, to defer their judgment until a more extended knowledge of results was obtained. There were certain cases in which he thought the internasal method could not be applicable—viz., where there were indications of diseased bone in the sinus, in cases of external fistulæ, bulging of the walls of the sinus, and, as in Mr. Tilley's case, where "loculi" were found in the sinus. In these cases he had always found that an external operation was required. In cases in which the foregoing conditions did not exist, he had been well satisfied by the results of removal of the anterior half of the middle turbinate bones, and, if necessary, the curetting of the ethmoid cells, and washing out of the sinus. In one case he remembered there was complete recovery in six or eight weeks in this way, washing out the sinus three times a week. In doing the external operation experience had taught him to avoid extensive operations on the bony walls of the sinus. By opening through the floor and lower part of the anterior wall of the sinus he was enabled to explore the sinus and enlarge the passage into the nose, having previously removed the middle turbinate; in this way he got free drainage and cure of the disease.

Dr. H. J. Davis said he had always felt reticent about doing resection of the septum in suppurating noses, because of the possibility of infection. He had seen instances where, after this had been done, the septum sloughed away. When he was at the Boston International Otological Congress, Dr. Mosher was very good in showing surgeons his specimens. He (the speaker) had operated upon fifteen, and he thought Mosher, in leaving the middle turbinal, meant it to be a landmark. By keeping external to this, the cribriform plate could not be damaged. The position of the agger nasi cells varied in different skulls. The best way to get into them was to place the finger on the lachrymal bone, pass a small Volckmann spoon into the nose, and try to hit off one's finger with the spoon. If one was low down, the spoon could not penetrate; but if one was over the exact spot penetration was easy, and under cocaine one could pass a frontal sinus cannula. In washing sinuses out, tincture of iodine had a very rapid effect; hydrogen peroxide and other lotions were not, in his opinion, so efficacious. The reason that some cases which had the radical operation done did not do well was that the operator wanted to do too much, and did not know when to stop. He had had two cases of death after the external operation, the skull and brain of one of which was shown before the Section two years ago. He had operated upon this man twice intranasally, but he worried to be taken into hospital again for constant pain, and he was operated upon externally by Killian's operation. An abscess in the frontal lobe was opened and drained, but the patient, a man, aged 30, died of basal meningitis. The abscess in the frontal lobe had evidently been the cause of the incessant headaches. Personally, if he had a frontal sinusitis he would prefer the external to the internal method of operation.

Mr. Norman Patterson said he felt particularly interested in Dr. Peters's remark about an incision through the septum. For some considerable time past he had been trying a method of operating through the septum from the other side of the nose. After performing a submucous resection in the ordinary way, he made an incision through the muco-perichondrium, on the opposite side, parallel to the original incision, and half an inch behind it. One could work through the gap thus made by using a StClair Thomson speculum. In this way an excellent view was obtained of the ethmoidal region. Recently, at Golden Square, he operated on a case in which a fortnight previously he had done a submucous resection. In this case both ethmoids were diseased, and he made an oblique incision through the septum, and with comparative ease he dealt with the disease on both sides. Afterwards he inserted stitches into the septal incision, and union was perfect. The farther forward in the nose the disease the better the view. He thought this method would be useful in frontal sinus cases. He had found it of use in sphenoidal sinus disease.

The CHAIRMAN (Dr. Hill), in summing up the debate, said that, as far as he could gather, the majority of the members of the Section had come prepared to "damn with faint praise" the per-nasal treatment of long-established frontal sinusitis in spite of the perusal of the able papers of the introducers, which had been circulated in advance. Many, no doubt, were still impressed by the a priori objections which had been so lucidly summarized by Sir StClair Thomson, more especially as regards the dealing blindly with hard bone in a dangerous area in the later stage of the operation and the limited nature of the surgical measures which it was possible to carry out on the diseased mucosa, compared with what could be done by the external obliterating operation. If mere, but efficient, drainage and irrigation through an enlarged infundibulum were really proved to be a curative measure in itself in many cases, then the minor operation of enlarging the fronto-nasal canal by a small external incision at the inner angle of the orbit, as advocated by Dr. Donelan, would effect this without running the possible risk of perforating the cribriform plate or the internal table. Mr. Howarth and others were satisfied with the old per-nasal method—namely, of removing part of the turbinal, followed by breaking down the bulla and the cells above, and then inserting the bent metal sound in an upward and forward direction through the ostium; when this could be carried out, as it sometimes could rather easily, this more posterior route had the advantage over the more anterior one in that the hard bone of the nasal process and the crista had not to be dealt with, more or less in the dark, by formidable instruments; on the other hand, the operative field was in dangerous proximity to the cribriform plate, and one could not look straight into the sinus from the anterior naris, as was possible in cases shown that afternoon. The cross (×) in Mosher's diagram, which had been shown on the screen by each of the introducers, was situated over the cells immediately posterior to the fronto-nasal duct—the cells which Mr. Howarth and others still opened in some cases according to the old posterior method, and this diagram in Mosher's paper dealing with the agger cells and the more anterior route had led to great confusion, and had probably been inserted in the wrong place; at all events, the cross was in the wrong place in the diagram if intended to indicate the point of penetration in the agger route. He (the speaker) did not think there was any mystery about these agger cells; they were, he had always understood, the maxillo-ethmoidal cells of the text-books. Two speakers only, Dr. Peters and Mr. Harty, had actually performed operations of the new type advocated by Dr. Williams and Mr. Tilley, and it was significant that whilst they both gave the method their support, those who had raised objections had not referred to any personal experiences of their own. Dr. Cathcart had called attention to a somewhat disconcerting fact, which probably many of them had in their minds—namely, that the advocates of the new per-nasal operation were amongst the most experienced and expert exponents in this country of the external radical operative methods, and yet they now came forward and stated, as the result of their recent considerable experience, that as far as they were concerned the per-nasal operation was the operation of choice in an ordinary uncomplicated case of chronic frontal sinusitis. Such a deliberate pronouncement could not be ignored coming from such authorities. The method of operating adopted by each was similar in principle, and differing only slightly in detail. Mr. Tilley used rasps for the crista, whereas Dr. Watson-Williams employed a burr as well; the latter used larger sounds in the subsequent treatment than the former. Mr. Tilley removed a portion of the middle turbinal as a start, whereas Dr. Watson-Williams retained it at first, at all events, as a guide and guard to prevent injury to the cribriform plate, just as Killian did in his ethmoidal exenterations. His (Dr. Hill's) own experience had been limited to the passage of a frontal sinus cannula in a few acute cases, and in chronic cases with acute exacerbation he had occasionally removed the anterior extremity of the middle turbinal and passed a metal sound into the sinus if it would go up easily; and it was a curious fact that it often did go up easily in chronic frontal sinusitis. He had not, however, systematically washed out the sinus, nor had he ever attempted this new Ingals-Good type of operation. Dr. Good presented him with his infundibular rasps last year, but up to now he had never ventured to use them, and he had been rather afraid of the look of Dr. Halle's drill and burr-head; if, however, in the future he (the speaker) came across a case in which he could easily pass a fairly large sound into the frontal sinus after the old method, he was inclined to think he would not really be running much risk in using Dr. Watson-Williams's drill with guarded burr to enlarge the opening forward.

The discussion had been a most instructive one and showed that, in the expert hands of the introducers of this discussion, the newer per-nasal procedures advocated were safe and usually effectual; and in view of the equally satisfactory reports from abroad from an increasing number of adherents, those who had up to now been accustomed to rely almost entirely on external operations would probably feel that it was at least incumbent on them seriously to reconsider their attitude towards this question.

Dr. WATSON-WILLIAMS, in reply, said he was sorry to have given the impression that he had taken up the intranasal route to the exclusion of the external operation; that was not so. The intranasal method, however good, had its limitations, and it was not suitable in a small percentage of cases. For such he had himself devised an external operation, and found it very satisfactory. All he contended was, that by employing in the intranasal operation the methods of anterior entry the sphere of usefulness of the intranasal operation would be much increased. Sir StClair Thomson referred to some of the skiagrams he had exhibited as showing the bougie in the orbito-ethmoidal cells, but that was an optical illusion. Those skiagrams were to show that the 6 mm. thick bougies were carried back by the nasal crest so as to lie against the tabula interna (the swan-head bougies had a thin neck, so the lower part did not push the tip back so much), and that for the same reason it was most dangerous to use unguarded burrs or chisels in this region. Other skiagrams showed that after removing the nasal crest one could pass the instrument straight up well into the frontal sinus (cf. figs. 15, 16, p. 134). Mr. Howarth had suggested that the forceps might impinge against the frontal process of the superior maxilla, but in practice he would find it was not so. Often agger cells were not present. Like himself, Vacher and others removed these cells long before Mosher at Liverpool emphasized their importance, and helped us in so many ways by his work. Dr. Dan McKenzie appeared to be afraid of the new method, yet not so long ago he (the speaker) shared all those fears, till actual experience gradually dispelled his anxiety, and he thought his methods removed all dangers. By going through the anti-conchal cells one was in front of the cribriform plate, and the latter could not be endangered until one got farther back.

In answer to Dr. Peters's question as to how a case with polypi should be dealt with, Dr. Watson-Williams stated he had shown a specimen with an enormous number of polypi in the frontal sinus. There was a large fronto-nasal duct, and there were no symptoms because of the size of that duct. If one imitated Nature by making a large opening there was rarely trouble from polypi in the sinus.

He could not agree with Mr. Tilley in some of the points he had emphasized in his paper. Mr. Tilley said that when acute symptoms persisted in spite of palliative measures or of mere anterior middle turbinectomy allowing of no effective lavage, and especially when swelling and œdema appeared in the eyelids and in the soft tissues over the sinus, external operation would be called for, but he (Dr. Watson-Williams) found that the more acute cases were most responsive to intranasal operation, and clearance of the anti-conchal and fronto-ethmoidal cells should at least be tried, despite the presence of the symptoms mentioned, provided, of course, there was nothing worse. Even the occurrence of subperiosteal orbital abscess did not contra-indicate intranasal operation, and there were cases on record where opening the ethmoid cells relieved such a severe orbital complication. Mr. Tilley further mentioned, among the conditions which should influence operators in selecting external methods of operation, when the sinus ostium was situated above the level of the cribriform plate, and when the posterior wall was so low as to closely overhang the ostium. To this the speaker replied that the sinus ostium was usually as high as, and very often higher than, the level of the cribriform plate, and he would consider that the higher the ostium the less the risk to the cribriform plate from the intranasal operation with retention of the middle turbinal plate intact, while the fact that the tabula interna overhung the ostium could not be detected by a skiagram, but if one avoided all gouges, chisels and unguarded burrs there was no undue risks. Mosher's method of entry, which was followed by Mr. Tilley, he should consider unsafe.

With regard to his case, which subsequently died, Professor Walker Hall's, the pathologist, report showed that the frontal sinus operation had nothing to do with the death ; there was no meningitis, death having been due to cellulitis of the leg and pyæmia. Still, he had thought it right to bring the facts forward.

With reference to the question of Mr. H. J. Davis, Dr. Watson-Williams considered it was better if possible to postpone operations on a deflected septum, which, except in extreme deformity, did not prevent removal of the anterior ethmoidal cells and entry to the frontal sinus.

Mr. Hope was mistaken in saying that he (Dr. Watson-Williams) had spoken of 9 mm. space as usual and pointed out that 6 mm. was the maximum, often only 4 mm. was safely available.

Mr. Herbert Tilley, in reply, said he joined issue with Sir StClair Thomson as to the specimen he had shown ; if the cells were removed, which had been referred to in the opening papers, one could drain the fronto-ethmoidal cell in the specimen, which Sir StClair Thomson said could only be attacked by the external operation. In answer to Dr. Peters's question as to polypi in the sinus, he had referred to the treatment of this condition in his paper. When there was polypoid degeneration in a sinus, by irrigating and injecting warm air, and then injecting iodine or nitrate of silver, one reduced the villous condition of the mucous membrane, and little was secreted except clear mucus.

Dr. Donelan said the operator did not know where he was when operating by the intranasal method, but his (the speaker's) reply was, that he knew where he was if he set out to master the anatomy of the parts and worked in the way which had been described in the opening paper. By removing the anterior cells one found oneself in a large cavity (the frontal sinus), and free drainage was provided from the lower end of that cavity. If there was much bleeding, and one put in strips of gauze moistened with cocaine and adrenalin, it was surprising how much one could see.

In answer to Mr. Hope, he did not bother about the depth of the sinus in the intranasal operation. On the contrary, with the external operation one would have a deep sinus and scar, and possibly a dead space, which could not be obliterated. In that kind of case the intranasal operation was a great advantage. The external operation implied disfigurement, and some six weeks' treatment, with dressing every day. These considerations had done much to determine his preference for the interior operation. Two days ago in London he operated upon a man by the intranasal method; he had double frontal sinus suppuration. That day he went to wash him out, and he asked whether he could go out within the week (three days after the operation) as he had now no headaches. Such an event was unthinkable with the old operation.

With regard to Mr. Low's combined operation, he had had no experience of it.

Concerning the danger of the intranasal operation suggested by Dr. Cathcart, unfortunate cases were sure to be heard of, but the intending operator by this method should be well up in the anatomy of the part, and practise the operation on a few skulls first.

With reference to necrosis of the frontal sinus walls, for two years he had not had such a case, and in such an event it would be recognizable by external symptoms. If such were present he would do the external operation, or for ocular or meningeal symptoms, or the escape of pus into the orbit. He thought that the majority of cases of chronic frontal sinus suppuration with polypi in the nose would be satisfactorily dealt with in the future by the intranasal method, while a minority would have to be treated by the external operation—i.e., a reversal of the old procedure.

Laryngological Section.

May 1, 1914.

Dr. D. R. PATERSON, President of the Section, in the Chair.

X-ray Photographs of Pharyngeal Pouches in Three Patients, aged respectively 55, 54 and 63.

By W. MILLIGAN, M.D.

DISCUSSION.

The PRESIDENT (Dr. D. R. Paterson) asked what had been done in the case of those three patients, whether they had been operated upon. He reminded the Section that there had been two or three cases shown, by Dr. Kelson and others. Dr. Kelson had operated upon his under local anæsthesia, and had a very good result. As had been said, the danger was from septic trouble. Last year he showed a patient who had a pouch, and when he explained to the man the possible danger of septic trouble, he declined to have an operation, and was content to remain as he was.

Dr. MILLIGAN replied that he had brought photographs of four cases. Three had been operated upon, and the fourth was being prepared for operation, but was not yet ready because he suffered from carious teeth, and the general condition of the mouth was not as it should be. External operation had been done on the three, and the pouch removed, and these patients all recovered. He had had one fatal case, due to septic pneumonia. He thought it was owing to an error in judgment in removing the feeding tube too soon, for it seemed to have been ingestion pneumonia. Altogether he had seen seven such pouches. The first case he had he placed under the care of the late Sir Henry Butlin, and it was the third pharyngeal pouch which had been operated upon in this country. The diagnosis in that case was originally cancer of the œsophagus, but he did not agree with it, neither did Sir Henry Butlin. The patient was still alive, and his age was now 80. He was indebted to Dr. Hill for calling attention to Halstead's operation. He had not yet performed it. In his series of cases the operation was done at one time. The wound in the œsophagus was as carefully sewn up as possible, and a tube passed through the nose beyond the point of the operation, and kept in situ for a week. In the first case he saw with Sir Henry Butlin the wound leaked into the neck for days, but no harm resulted. He felt inclined to do a Halstead's operation in his next case.

X-ray Photographs of Carcinoma of the Œsophagus in Two Patients, aged respectively 49 and 71.

By W. Milligan, M.D.

Removal of Foreign Bodies from the Œsophagus.

By W. Milligan, M.D.

(1) *Safety-pin removed from the œsophagus of a female patient, aged 20.*

(2) *Safety-pin removed from the œsophagus of a female patient, aged 25.*—Patient arrested for being drunk and disorderly. At police station confessed to having swallowed a button. Button passed ultimately *per rectum.* Two days later had a rather severe attack of bleeding from the throat, followed upon the next day by a still more copious hæmorrhage. Confessed then that she had also swallowed a safety-pin. Admitted to the Royal Infirmary. On examination, œsophagus found to contain blood and a safety-pin—the safety-pin lying about the level of the sixth dorsal vertebra. Safety-pin removed with forceps. Œsophagus sponged with solution of H_2O_2. Rectal feeding. Temperature chart shown. Development of acute suppurative mediastinitis; death. Post-mortem examination revealed two ulcers leading through the wall of the œsophagus into the posterior mediastinum.

DISCUSSION.

The President said it was difficult to remove a safety-pin with the point directed upwards, and he would like to know what form of forceps was used. If one could see the point it was well to do as he did in one case, pass a very fine tube over the point, and then not trouble further about the point, but seize the other portion of the pin and withdraw it, knowing that there need be no anxiety about the point. When the point was embedded it was somewhat difficult to manipulate the tube over it.

Mr. HERBERT TILLEY asked how the point was disengaged, and whether Dr. Milligan closed the safety-pin first.

Dr. MILLIGAN replied that he used what was practically the President's type of forceps, only longer, heavier, and thicker. They were excellent. For some cases it would be an advantage to have the blades serrated. He passed down the pharyngeal tube so as to cover the point of the pin. In Case I he saw the point distinctly, but not in Case II. He had read of the President's method too late to apply it in this case.

Microscopic Section of Carcinoma of the Thyroid Gland in a Female Patient, aged 56.

By W. MILLIGAN, M.D.

OPERATION attempted and found impracticable owing to adhesion to and involvement of the growth in the left common carotid artery and the lateral wall of the trachea. A radium emanation tube (100 mg.) inserted into the growth and left in situ for twenty-four hours. Shrinking of the growth noticed within forty-eight hours, followed by improvement in swallowing and in general comfort.

Inoperable Fungating Carcinoma of the Œsophagus in a Male Patient, aged 36.

By W. MILLIGAN, M.D.

TREATED by means of a radium emanation tube (80 mg.); tube retained in situ for eighteen hours, followed three days afterwards by a further application of radium (50 mg.) for twenty-four hours. Marked improvement in swallowing; diminution of fœtid secretion and of hæmorrhage.

DISCUSSION.

Sir FELIX SEMON, K.C.V.O., said he recently saw an operation performed by Mr. Trotter, in which an extralaryngeal carcinoma was removed, and by the urgent wish of the patient himself a tube containing 80 mg. of radium emanation was inserted in the place from which the growth had been taken. The operation was beautifully performed, but at first the results were apparently disastrous, because all the tissue round the radium tube melted away like butter in the sun, and the carotid was seen pulsating, lying in a big hole, which extended almost from the clavicle to above the larynx. It was feared that the disintegration of tissue might extend into the chest, and that the carotid might be eroded, but that did not occur. However, unfortunately the patient got pneumonia, from which he died on the ninth day after the operation. Thus the mere insertion of radium emanation in a wound in that neighbourhood was not free from risk. With regard to insufficient screening, the radium emanation and screening were prepared by Mr. Pinch, of the Radium Institute, who had had a very large experience in such matters.

Mr. HARMER said that at his hospital radium had been buried in several cases for carcinoma, either because of glands or of growth in the pharynx, and there was very grave risk that the wound would never close. Two months ago he put some radium in a patient's neck after removing a mass of glands because there was a growth in the mediastinum which could not be removed; 150 mg. of radium were buried in that growth and left there for eighteen hours. Afterwards the wound absolutely refused to heal, and nothing that could be done seemed to influence its indolence. He feared that mediastinitis would result, and possibly death. It should be recognized that there was a difference between applying radium down through the throat and radium buried from the outside into the neck. He believed that radium buried from outside sometimes had a bad effect.

Mr. SOMERVILLE HASTINGS said he had had experience with radium in some sixteen or eighteen cases, but in only one was there sloughing, and that was where he had not taken the trouble to clear out the mouth, but had left some septic teeth remaining. In that case the sepsis came on in the third week after the application. For the œsophagus he had sometimes embedded radium in the posterior wall. But his usual method was to pass a Symonds's tube through the growth and then take the radium tube, cover it with pure india-rubber, and, guided by the œsophagoscope, drop it into the Symonds's tube, attaching a piece of lead to the top of it to prevent it slipping too far down the tube. It kept in position very well, and could be pulled up again quite easily by the attached silk. He found that by this means he was able to keep the radium in the required position much more easily than by means of the usual bent wire arrangement. Moreover, the silk was much less irksome to the patient than the wire. In reply to Mr. Tilley, he said that he dilated with the œsophagoscope tube in position and then passed the guide before withdrawal of the œsophagoscope. The Symonds's tube or funnel was then threaded over the guide and pushed down the œsophagus the necessary distance.

Sir STCLAIR THOMSON asked whether any member had ever had a successful case of operation for carcinoma involving the thyroid, taking as a standard of success the absence of recurrence for three years. He had not found a case suitable for operation, and he had frequently persuaded subjects of this condition not to have an operation done. In some cases in which that advice was not followed he knew there was cause to regret it.

The PRESIDENT reminded members that several discussions had ensued at the Section on the treatment by radium. One case of Mr. Tilley's was very satisfactory, so that there was nothing to see when the patient appeared at the Section. Mr. Hastings also showed one patient, who was now well. The present type—namely, the œsophageal ones—seemed more difficult to treat. Information was still needed as to the ultimate effect in these œsophageal malignant strictures. One wanted information as to how long the effects of radium lasted; whether the result of the application was only temporary or permanent. Reference had been made that day to some evil effects of radium, at all events of burying radium in the tissues. The application of this substance should be made with care when dealing with the food passages or air passages. The whole question appeared to be yet in a fluid condition; more information was required before definite views could be formed.

Dr. MILLIGAN, in reply, said the discussion had become somewhat mixed. He was referring, not to the use of a radium salt, but to the use of emanation tubes. The point was to get the effect of the γ-ray, and exclude the deleterious effect of the α and β rays. He therefore agreed with Dr. Hill as to the necessity for careful screening. But that was difficult on account of not being able to estimate properly the size of the growth in these regions. A perspective view of the growth might be deceptive. Much remained yet to be learned in regard to screening. In answer to Sir Felix Semon's remarks, he regarded it as impolitic to irradiate healthy tissue. In the case narrated by Sir Felix, a tumour was apparently beautifully removed, and presumably completely, by the operation, and yet the healthy tissues were irradiated, and sloughing resulted. Mr. Tilley's case was sarcoma, and if there was one condition which disappeared quickly under radium it was sarcoma. It was quite different with carcinoma, and even now the exact dosage of radium for different types of carcinoma was not known. In several years' time probably the profession would have definite information as to dosage for different types. He agreed with Sir StClair Thomson's remark as to malignant disease of the thyroid. He had seen a fair number of such cases, but he did not know of any one, whether operated upon or not, which was alive three years afterwards. It was difficult to determine whether the thyroid was adherent to the trachea. The lady referred to was examined by two or three of his colleagues, and it was thought that the growth was not adherent to the trachea. When he cut down and found it was adherent he gave up the operation, knowing how unsatisfactory these cases were. For that reason, also, he put in an emanation tube, and it had a very extraordinary effect in relieving the symptoms, though he did not expect that it would do more than that. Certainly it had increased her comfort both in swallowing and breathing. With regard to the other case, since he wrote the note the patient had died. He had acute pericarditis, with much effusion into the pericardium. He did not know whether it was connected with the application of radium or not. The patient was an old rheumatic subject, and had had endocarditis. He had only three days' illness. In his case the radium was well worth using, because it relieved his condition so much. The emanation tube was kept in twenty-four hours, and he had no attack of hæmorrhage after its application, and within a few days the pain in his ear had disappeared.

A Case of Laryngeal Neoplasm.

By W. Jobson Horne, M.D.

The patient, a woman, aged 52, had suffered from loss of voice for over twelve months. The aphonia gradually developed. The neoplasm sprang from the anterior part of the larynx. The patient was by no means an easy subject for direct or indirect laryngoscopy. The mouth was not opened well, and the tongue was thick and unyielding, With a little training he hoped that it would not be necessary to fall back upon the direct method. When removed the growth would probably be found under the microscope to be innocent.

DISCUSSION.

Mr. Clayton Fox thought it was an œdematous hyperplasia, springing from the anterior end of the left vocal cord, and not from the commissure.

Mr. Cyril Horsford considered that the growth had an infiltrating character, that it grew from the anterior half of the left vocal cord, but there was much surrounding congestion and thickening of cord, and if a piece could be removed he thought it should be carefully examined under the suspicion of malignancy.

Dr. Jobson Horne replied that at present he was not quite certain where the growth originated. He looked upon the growth as an excrescence, not as infiltrating, and he regarded it as innocent.

A Case of Unusual Webbing of the Soft Palate.

By W. Jobson Horne, M.D.

The patient, a man, came under notice on account of deafness. There were no symptoms referable to the throat. The soft palate, however, presented a most unusual appearance. The arches between the uvula and the anterior pillars of the fauces were filled in with a web which extended down to the tip of the uvula. The webbing was extreme.

DISCUSSION.

Mr. Clayton Fox thought the condition of the palate was congenital. He knew of a similar case (in a female) though not so pronounced. It was not giving rise to any phonetic troubles, for although there was occasional hoarseness, this was due to chronic laryngitis, the result of nasal obstruction. He suggested a submucous resection as the only treatment applicable to such a case.

Dr. Jobson Horne replied that he was aware of some nasal obstruction; he had, however, shown the case, not with reference to the nasal septum, but on account of the abnormal condition of the soft palate with which he did not propose to meddle.

A Further Report upon a Case of Laryngeal Neoplasm.

By W. Jobson Horne, M.D.

The growth occupied the right vocal cord. When the patient, a man, was before the Section at the January meeting[1] opinions were divided as to whether the growth was an epithelioma or a gumma. Prior to that meeting anti-luetic treatment had been instituted, and since then it had been pushed, and salvarsan had been given. Dr. Jobson Horne regretted that the patient had not been able to come to London that day. He had heard that the laryngeal condition had cleared up considerably under the treatment. He hoped that the patient would be able to attend at a future meeting.

Complete Paralysis of the Left Vocal Cord.

By E. A. Peters, M.D.

E. S., previously exhibited (March 6) with left abductor paralysis and œsophageal growth. The patient was seen again on March 16, when it was evident that the left cord was completely paralysed. The cord was curved and the arytænoid prolapsed forward. There was no respiratory movement. The patient spoke with a husky, thin voice. On vocalization the left cord does not approach the other, but remains in the cadaveric position.

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[1] *Proceedings*, p. 73.

DISCUSSION.

Mr. CLAYTON FOX remarked that there was a twitching of the arytænoid on the paralysed side, showing that there was no ankylosis of the crico-arytænoid joint.

Dr. JOBSON HORNE said that the case illustrated the importance of noting an alteration in the voice as possibly a valuable clue to a deep-seated disease, and also the importance of investigating the cause of that vocal change by means of the laryngoscope. Loss of voice, or even huskiness, due to paralysis of the vocal cord, through implication of the left recurrent laryngeal nerve, might be the first indication of an œsophageal growth.

Dr. PETERS replied that when he previously showed the case there was only abductor paralysis of the left cord; and in view of Sir Felix Semon's remarks that it was exceptional for these cases to be traced through from one stage to the other, and as within a week of exhibiting the patient at the Section complete paralysis of the left cord had developed, he hastened to bring the case up. There was a growth a considerable way down the œsophagus, and he thought the history and present condition excluded ankylosis. He regarded it as a paralytic condition due to involvement by glands.

Microscopic Specimen from a Woman, aged 26, with a Growth on Anterior Third of Left Vocal Cord.[1]

By JAMES DONELAN, M.B.

IN view of the suggestions made in the course of the discussion the removal of the growth was attempted by the direct method. Owing, however, to the patient's perfect set of teeth, and the unusually short distance from them to the epiglottis, it was impossible to pass a tube behind the epiglottis in a satisfactory position for an operation of this kind, though several attempts were made by a colleague accustomed to the manœuvre as well as by the exhibitor. The growth was removed a day or two later by indirect method, when it was found to have the structure of a papilloma.

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[1] Shown at March meeting (*Proceedings*, p. 119).

Microscopic Specimen from a Growth on the Anterior Third of the Right Vocal Cord in a Woman, aged 44.

By JAMES DONELAN, M.B.

BY a curious coincidence a day or two before the preceding case was operated on this patient presented herself with a warty-looking growth in an exactly similar position but on the opposite cord. It was decided also in this case to attempt the removal by the direct method. The patient being edentulous an excellent view of the larynx was obtained, but just at the moment when the forceps were being introduced for the removal of the growth the battery, which had been used for a long time in connexion with the previous case, suddenly failed, and as it was impossible at the moment to get another the removal was deferred and was carried out easily on the following day under local anæsthesia by the indirect method. The specimen appears to show the structure of a papilloma.

DISCUSSION.

Sir STCLAIR THOMSON, referring to both these cases, pointed out that the attempt was made to remove the growth by the direct method, but it failed in each case; and in one of them it was said the growth was "easily" removed the following day by the indirect method. That led him to ask if it was becoming the fashion to use the direct method first in laryngeal cases, and if so, why? He also asked if it was becoming more frequent on account of the haste to be in the fashion. He had no hesitation in speaking on this subject, because he did not feel that he was behind the fashion, seeing that he was one of the first to go to Freiburg to study the method, and he believed King's College Hospital was one of the first institutions to have Killian's outfit in London. He asked Professor Killian recently in Berlin, and he had also asked Professor von Eicken the same question, whether they always used the direct method? The reply was that they never used the direct method when the indirect sufficed. He believed it was a Hippocratic principle which should be remembered, that removal of anything should be *tuto, cito et jucunde*. He asked anybody present to let a skilled person pass a Brünings's tube into his larynx, in order to cauterize or perform a simple operation, and then to let him (the speaker) do it by the indirect method, and report as to which was the more "*jucunde!*" He had no hesitation in saying that the majority would detest the direct method, and there would be no complaint in the majority of cases from the indirect method. He heard of this tube being passed down into the larynges of unfortunate tubercular patients in order to have lactic acid swabbed about, or to have the galvano-cautery applied—a most unsuitable method. By the indirect method one had before one the whole larynx in a panoramic view, and it was much easier to apply the galvano-cautery, and it could be done more thoroughly "*tuto, cito et jucunde*" than by the direct method. He made that appeal for the sake of the patient. Both these patients now reported were submitted to several attempts, even by a colleague accustomed to the necessary manœuvres, yet it had to be given up. Perhaps Dr. Donelan would explain why, in the case of each of these patients, he did not use the indirect method. He (the speaker) regarded the indirect method as most unsuitable for growths in the anterior commissure also. In order to be in the fashion years ago, in several cases he tried the direct method, and in one case in which he failed he removed the growth easily by the indirect method by the help of Horsford's epiglottis suture. The patient told him afterwards what a torture the first procedure was, and how tolerable was the second. He was not now referring to suspension laryngoscopy, because there were cases in which the suspensory method was very suitable. What he wished to do was to enter a plea against attempting to do work on the larynx by the direct method when it could be done more "*tuto, cito et jucunde*" by the indirect.

Dr. JOBSON HORNE agreed generally with all that Sir StClair Thomson had said. To his own patient he mentioned that it would be necessary to remove the growth, and the patient expressed a wish for a general anæsthetic. Personally, he would prefer to remove it under cocaine and by the indirect method. The Section was much indebted to Dr. Donelan for having brought the cases. They were very instructive as showing the importance of teaching the rising generation how to use the indirect method. Years ago in that Section he expressed the hope that the art of removing laryngeal growths by the indirect would not be killed by the direct method in the way that the art of miniature painting had been killed by photography. Moreover, it must not be forgotten that direct endoscopy has its mortality.

Sir FELIX SEMON said he had at first not intended to take part in this discussion, because he belonged to the "old guard," and had retired. Anyone who, under such circumstances, spoke in defence of an "old-fashioned" method, like indirect laryngoscopy, was likely to be considered as an old fogey. But when it was said that the younger laryngologists would not "take the trouble" to learn the indirect method, the old fogey could not help asking himself, "Were they laryngologists, or were they not?" If that were the attitude of the younger generation, it was a very unfortunate one for the speciality to which he had devoted his life. The art of removing laryngeal neoplasms by the indirect method had in his own day justly been looked upon as the "blue riband" of laryngology. He agreed with Sir StClair Thomson's remark that operations should be done not only *cito* and *tuto*, but also *jucunde*. In 1901[1] he had published lectures which, at that time, caused considerable controversy about the use of modern methods of treatment in diseases of the upper air passages, in which he had quoted the Gilbertian saying that, "The punishment should be made to fit the crime." He still was of opinion that it was the duty of the laryngologist to make the "punishment"—i.e., his method—fit the "crime"—the disease. The direct method, which surely was anything but pleasant for the patients, should not be applied when the indirect one would suffice. He had always tried to avoid being in the rearguard, and he had welcomed all useful new methods, whether they were direct or suspension laryngoscopy, but he would deeply regret if the indirect method of removing growths from the larynx, which not so long ago was considered the main reason why laryngology should be recognized as a distinct speciality, should be superseded, simply because some of the younger generation did "not want to take the trouble" to learn it.

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[1] *Brit. Med. Journ.*, 1901, ii, pp. 1313, 1396.

Mr. WAGGETT pointed out that the younger members of the speciality did not to-day get many chances of removing growths from the larynx, and he was inclined to urge them to take every opportunity of practising with angled probes and forceps, lest an essential element in the delicate art of laryngology should be forgotten and wholly superseded by the easy but comparatively rougher methods of direct endoscopy.

The PRESIDENT said members would all feel indebted to Dr. Donelan for his cases, because by bringing them forward he had performed a service to the Section. He (Dr. Paterson) had used both methods for a considerable time; and he thought everyone would agree that, where a general anæsthetic was necessary, the direct method was the one possessing the greatest advantage. He did not know that suspension had made much difference in the matter of diagnosis, or for the removal of growths from the anterior commissure. He still thought suspension laryngoscopy unsatisfactory in that respect. Only two days ago he found it difficult to remove by that means the remains of a papilloma from the anterior commissure of a patient, perhaps partly because laryngofissure had been performed on the patient a year before and the larynx was fixed by scar tissue to the skin. The remarks of Sir StClair Thomson should be borne in mind; there was no doubt some people tolerated the direct method very badly. He remembered the days before the Killian tubes came in, when Kirstein's tubes were used, involving considerable pressure on the tongue, so that only one-sixth of the patients he tried it on at that time could tolerate it. He therefore gave up the method until Killian produced the tube-spatula, which required less pressure and was very much better for the patient. If he could get away a growth by the indirect method, he preferred it; he considered it was better for the patient, and he did not find it difficult as he had been trained to it. But, on the other hand, many men had become very facile with the direct method. He remembered Professor Hartmann, three years ago, speaking of the value of local treatment in tuberculous laryngitis and showing a tube-spatula, which differed but little from the ordinary one, except that it had a wider entrance; Hartmann said it was easily introduced, and that he had been using it in tubercle of the larynx with great advantage. Perhaps patients in this country were not so tolerant as those on the Continent. Attention should be paid to what Sir Felix Semon and Sir StClair Thomson had said, but he would be very sorry now to give up either method.

Dr. DONELAN replied that Sir StClair Thomson had apparently forgotten their conversation about one of these cases at the previous meeting, in the course of which he (Dr. Donelan) had suggested this might be a good opportunity of getting up an informal discussion on the relative merits of the two methods. "Why" he had used the direct method in these cases was simply that he felt he had as good a right as anyone else to do what was apparently the everyday practice at present, and he felt that for once he ought to be in the fashion. As regards the "*jucunde*" part of it, as both patients were very nervous he gave them chloroform. They consequently suffered no inconvenience and had so little subsequent irritation that it was possible to remove the growths completely the next day by the indirect method. With the exceptions already referred to, he was a believer in the advisability of at any rate attempting the removal of all laryngeal growths by the indirect method. He had long ago learned and practised that method under Sir Morell Mackenzie, one of its most brilliant exponents. He was sorry to gather that the rising generation were not more regularly practising the indirect method, as apart from the removal of growths its use conferred great dexterity in all kinds of intralaryngeal treatment. Perhaps he might usefully recall the suggestion of Sir Morell Mackenzie that it was not at all necessary to have a "phantom" larynx or other elaborate arrangement for practice. A dice-box served very well, and he had frequently seen Sir Morell Mackenzie "keeping his hand in" by picking small objects out of one by the indirect method. He was glad to think that though he had appeared to stand in the pillory for a few minutes he had done so in a good cause, and he ventured to hope that some good would come of it by a more general use of the indirect method.

An Œdematous Fibroma depending from the Left Vocal Cord.

By L. H. PEGLER, M.D.

PATIENT, a woman, aged 50, complaining of hoarseness. On the left vocal cord can be seen an œdematous fibroma which occupies the greater part of its free border and rises above the glottis on expiration.

DISCUSSION.

Dr. JOBSON HORNE regarded the growth as one for removal by the indirect method, which showed it very well. Exception, he thought, might be taken to the term "œdematous fibroma," by which the growth was described in the notes. Speaking generally, the terminology of growths of the vocal cords was far from perfect, inasmuch as it was not sufficiently descriptive of their histo-pathology. The œdematous appearance of growths springing from the anterior part of the vocal cord or the sinus of Morgagni was due to dilatation of the lymph spaces and cystic degeneration.

Mr. DE SANTI regarded it as solid fibroma, not cystic.

Dr. PEGLER replied that the growth was essentially a fibroma, œdematous from position. He showed an almost exactly similar case about seven years ago (reported in the first volume of the Society's *Proceedings*).[1] He would remove the growth by the indirect method.

Note.—Dr. Pegler wishes to add (June, 1914) that the growth was removed in one piece by Mackenzie's laryngeal forceps. Under the microscope the section showed a highly œdematous but not cystic fibroma.

Case of Chondrosarcoma of the Pharynx.

By C. I. GRAHAM, F.R.C.S.

PATIENT had complained of sore throat for one year. During the last two months he had noticed a swelling in the pharynx which increased rapidly in size; for fourteen days a swelling below the jaw on each side of the neck. There had been no dysphagia, but occasional attacks of choking. He thought that he had lost weight. He had been subject to bronchitis for many years. Recently there had been an excessive expectoration of blood-stained mucus. In the region of the left tonsil there was a large nodular swelling of a grey colour, but not ulcerated. On the right side a similar smaller mass could be seen; also some nodular growths on the arch of the palate. The submaxillary glands were enlarged on both sides. Sections of growth were reported to show chondrosarcoma.

Mr. DE SANTI thought it a very good case for diathermy. Part of the growth could be scooped out and the residue treated by diathermy. It would not cure the patient, but would give considerable comfort and prolong life.

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[1] *Proceedings*, 1908, i, pp. 8, 29.

Case for Diagnosis; (?) Lupus, Syphilis, or Mixed Infection of Nose, Right Ear, Pharynx, and Larynx.

By P. de Santi, F.R.C.S.

Boy, aged 16, who for two years has had severe ulceration of soft palate and pharynx, with a purulent right ear discharge. For eight months he has had an exuberant ulceration of left alæ nasi. No history of syphilis, congenital or acquired; no phthisis in family. No tubercle bacilli in expectoration; Wassermann reaction twice at Westminster Hospital, strongly negative; twice elsewhere, once negative, once modified Wassermann positive. The patient was sent to me by Dr. Sibley, who is treating the boy for his skin lesion. A section of the nasal region had been made and pronounced to be "typical epithelioma." On seeing the boy the one thing I was positive of was that the microscopic diagnosis was wrong.

Examination reveals old scarring of soft palate and pharynx with typical syphilitic appearances. Uvula and epiglottis gone. Swollen, pear-shaped arytænoids and ulceration of vocal cords.

The patient was shown by Dr. Sibley at the Dermatological Section in January; half the members were positive as to a syphilitic and half as to a lupus origin. My opinion is that the disease is lupus. Another section from the nasal lesion reveals lupoid tissue with giant cells.

DISCUSSION.

Dr. H. J. Davis suggested that the condition might be glanders, and that the patient's reaction to mallein should be tried. He agreed that the palate condition looked like syphilis, but syphilis, as a rule, yielded to treatment and so did lupus.

Mr. Clayton Fox thought the condition was lupus all through.

Mr. de Santi replied that the case was first sent to him with the diagnosis of epithelioma. A piece of growth had been taken from the nose by Dr. Knowsley Sibley, and the microscopic report was, as already stated, "typical epithelioma." This it certainly was not, however. The scarring of the soft palate and posterior wall of the pharynx was highly suggestive of syphilis. The patient had lost his uvula and epiglottis. The Wassermann test had been done four times; thrice it had been negative, and once mildly positive. There were no evidences of syphilis in the patient or the family.

Among dermatologists some said it was syphilis and others that it was lupus. He regarded it as lupus throughout. There were giant cells in a fresh section taken from the nose growth, but no tubercle bacilli had been found at all. He was at present giving iodide of potassium.

Perithelioma of Pharynx.

By J. Coubro Potter, M.D.

Mrs. M., aged 47, married. Complained one year ago of swelling behind angle of jaw, right side. Thought it was a gland. No previous illness. No loss of weight.

Family history: Father died of cancer, aged 75.

Present illness: Patient complained of slight pain in throat. No pain on swallowing.

When examined, a large swelling could be felt on right side of pharynx; movable, not painful. Growth was bulging soft palate. On palpation with finger behind angle of jaw the growth was the size of a hen's egg and was easily movable. It was tense, and felt somewhat cystic. The opinion was, at the time of examination, that the growth was encapsuled. No definite attachments could be made out.

Previous to coming to hospital the family doctor had explored with a hypodermic needle, with negative results. No enlargement of glands or any other growth.

Treatment: Examination under $CHCl_3$ confirmed the diagnosis, and the tumour was enucleated. Very slight hæmorrhage.

Examination of growth: Naked eye showed a definite capsule. On section the appearance somewhat resembled adipose tissue, and one portion was specially hard. Microscopically, the pathologist reported perithelioma.

DISCUSSION.

Dr. Leathem said he cut the sections, and he regarded it as an endothelial tumour. He was doubtful whether to apply the name perithelioma or endothelioma; it was encapsuled. Endotheliomata were mostly benign, although occasionally they formed secondary growths. The tumours sprang from the endothelial cells lining lymph spaces or from small blood-vessels. In this case, he would say, from the latter origin, as so many of the spaces contained blood.

Mr. Layton did not agree with the verdict given on the section. Though he was not a pathologist, it looked to him like an epithelial tumour. The late

Mr. Targett, with whom he had seen many sections, laid it down that a tumour should not be called endothelioma until it was certain it was not anything else; and there should be evidence of its arising from the lining of blood-vessels or from endothelial tissue. There did not seem to be any sign of that in this section. There were two or three layers which did not seem far removed from stratified epithelium. He suggested it was an adenoma, with a large amount of fibrous tissue from the wall of the pharynx. Another suggestion was that it was a tumour arising in gland tissue.

Dr. JOBSON HORNE said he saw the case before the removal of the tumour, and he did not regard it as malignant, but as innocent. He suggested that Dr. Potter be asked to bring the case up again, complete with all the clinical notes and histological reports on the growth, for further discussion. (Mr. Shattock, the pathological referee, reports that the growth, which is in the Museum, is a perithelioma.)

Epithelioma of the Epiglottis and Base of the Tongue.

By WILLIAM HILL, M.D.

MAN, aged 62, had been under treatment at hospital for two months for Eustachian obstruction. At his last visit, a week previously, it was noticed that the patient was a little hoarse, though he had never complained of throat trouble. On examining with the throat mirror the epiglottis looked as if it had been partially amputated, and was nearly $\frac{1}{3}$ in. thick; the lesion looked more like old lupus than subacute tuberculosis, but as the mammillated swelling was also seen in the glosso-epiglottic fossa, the possibility of its being malignant was recognized. The rest of the larynx was normal in appearance. A portion was removed for microscopic examination, and the case was proved to be one of epithelioma. As the disease was at present rather limited, and no enlargement of the glands could be *felt*, the case appeared to be very suitable for operation. Would a subhyoid pharyngotomy give sufficient access for removal of the epiglottis and adjacent parts of the tongue?

Mr. DE SANTI said that in the four or five cases he had had in which the growth was quite limited to the epiglottis, he had obtained good results from median thyrotomy—laryngo-fissure. It allowed one to get well at the base of the tongue, and it disturbed the patient less than did a lateral pharyngotomy. Three of the cases were still well, two and three years after the operation. In every case he removed the glands on both sides of the neck thoroughly, whether they were enlarged or not.

Laryngological Section.

May 27, 1914.

Dr. D. R. Paterson, President of the Section, in the Chair.

Epithelioma of the Maxillary Antrum and Hard Palate Three Years after Operation.

By E. B. Waggett, M.B.

Male patient, aged 65. The growth commenced in the region of the left upper molar roots, and probably originated in a paradental "rest." Six weeks' history of pain and swelling. The growth involved the left antrum, the nose, and both halves of the hard palate. Free removal of the major part of both superior maxillæ in February, 1911. No gland operation; no recurrence.

A temporary roof to the mouth was obtained by stitching the cut edges of the velum to the buccal mucosa, and above the imperfect diaphragm so formed a plate of rubber was inserted. The patient was thus enabled to take nourishment in the normal manner from the day of operation, and was out of hospital in eight days.

An operculum subsequently was made at the Dental Hospital, Leicester Square, and, with the exception of some lachrymal trouble on one side, the patient has been free from serious discomfort.

Sarcoma originating in the Floor of the Right Maxillary Antrum Two Years after Operation.

By E. B. Waggett, M.B.

Female patient, aged 17. Massive growth filling the antrum but not involving the orbital plate. Invasion of the inferior nasal meatus. The right palatine and post-canine regions occupied respectively by firm elastic prominences. Absence of "egg-shell" phenomenon. Dull nasal pain of some weeks' duration. No ulceration and no epistaxis.

Operation in January, 1912, a few days after detection of tumour by Dr. Moore, of Buckhurst Hill. The malar eminence, the orbital plate and pterygoid processes retained. No gland operation; no recurrence.

A rubber operculum, inserted at the operation, enabled the patient to take nourishment in the normal manner from the first.

A prophylactic application of radium produced a painful burn of the tongue and temporary fixation of the jaw. Mr. Turner released the jaw by progressive wedging, and fitted an operculum, which has relieved the patient of any serious discomfort.

Dr. Shaw reports the microscopic specimen as sarcoma composed of spindle cells, with fibrous tissue, giant cells and osseous tissue in places.

Endothelioma of the Nose Three Weeks after Operation.

By E. B. Waggett, M.B.

Female patient, aged 74. The left nose was distended by a soft, friable, opaque white tumour with a nodular surface, bleeding freely on manipulation and exhibiting expansile pulsation. The ascending process, left nasal bone, and nasal septum were displaced, with external deformity. (Specimens exhibited.) History of nine months' nasal obstruction and epistaxis. No pain.

Operation, May 7: Manipulation of the tumour after exposure through a lateral nasal incision caused brisk hæmorrhage, and the ascending process was quickly removed in order to gain adequate access to the unseen bleeding area. The tumour was then readily removed with the finger, and the hæmorrhage at once abated spontaneously. A remnant of the growth was then seen to hang by a broad pedicle from the free edge of the posterior half of the middle turbinate. As the anterior limits of the growth could not be defined, the ethmoidal labyrinth was removed *in toto*, and muco-pus was found in the sphenoid, frontal sinus and antrum.

In all three cases cricothyrotomy was performed, the pharynx plugged, and the tube removed at the end of operation.

DISCUSSION.

The PRESIDENT (Dr. D. R. Paterson) said this series was a very interesting one, and illustrated with what excellent results these extensive operations were carried out. The exhibitor had shown that the results were lasting. Where success was likely to be unattainable by operation, resort should be made to radium, as Dr. Hill and Mr. Tilley had done. But it was well to encourage operation in the first place, where that was possible.

Mr. HERBERT TILLEY agreed that Mr. Waggett deserved congratulation on these cases from the operative point of view. In his own student days, if patients came with so-called "malignant disease of the upper jaw," operative treatment used to be considered to be a very serious matter, with almost certain recurrence. He was led to speculate how far in the future treatment by means of radium emanations was likely to minimize the extent of the operative interference. Recently, in University College Hospital, there were two cases of malignant disease of the upper jaw, in which operation was frankly inadmissible, owing to the extent of the disease. As a kind of forlorn hope, two radium emanation tubes, each of 50 mg., were inserted, so that there should be a cross-fire action. In six weeks the disease had disappeared, and there was now nothing to show that the patients were anything but normal people. It made one wonder whether it might not be possible in early cases, by applying radium in this way, to obviate operation altogether. So far, the results were only of two months' duration, and he could not judge of their permanency. The type of disease in each case was columnar-celled carcinoma.

Dr. W. HILL said he had at the present moment under treatment a patient with malignant disease of the antrum and nasopharynx, who by six o'clock that evening would have had four radium tubes in situ for forty-seven hours. There was a slight rise of temperature the first night, but since then there had been none, nor evidence of physical disturbance, though the patient was 75. One tube of 100 mg. was put through the floor of the palate, a 50-mg. tube was inserted into the antrum by the intranasal route, one of the same strength in the nasopharynx in proximity to the left pterygoid region, and a smaller tube towards the ethmoid area, which also was invaded by the disease. One would think that in such a patient the mere placing of four tubes in position would be very disturbing, but the slight rise in temperature the first night was all that happened. There was neither hæmorrhage nor pain. Judging by Mr. Tilley's case, and one under Mr. Graham, and a similar case of his own treated two years ago where the nasopharynx and antrum were involved, we possessed in radium radiation a therapeutic method of remarkable palliative possibilities in cases where a radical operation was contra-indicated either on account of the extent of the disease or the feebleness of the patient.

Case of Laryngo-fissure for Epithelioma of Vocal Cord Nine Years after Operation.

By Herbert Tilley, F.R.C.S.

Patient is a solicitor, on whom laryngo-fissure was performed nine years ago for epithelioma of the cord.

Mr. W. was first seen by me in January, 1905, for hoarseness of five weeks' duration. A small, flat, reddish swelling occupied the middle third of the slightly congested right vocal cord. The latter moved less freely than the left cord. Sir Henry Butlin and Sir Felix Semon agreed that the condition suggested epithelioma, but thought a course of iodide might first be tried. This was done, with no good result. I performed laryngo-fissure on April 26, 1905. Microscopic examination of the growth proved its epitheliomatous nature. The patient is shown to illustrate the satisfactory result of the operation and the excellent voice which enables the patient to address public meetings.

DISCUSSION.

The President considered the result perfect. It showed how completely the disease could be removed by a limited operation.

Sir Felix Semon said he had seen the patient previously and again to-day, and thought the splendid result obtained justified the fact that operators in England did not rush to do total extirpation when milder measures sufficed.

Mr. Herbert Tilley replied that he had brought the case so that members might hear what a good voice the patient had. His practice as a solicitor brought him a good deal into "company" meetings, where those around him had no difficulty in hearing what he said.

Specimen of Vascular Fibromata removed from Larynx by the Indirect Method since the last Meeting of the Section.

By Herbert Tilley, F.R.C.S.

The larger specimen was situated in the anterior commissure and was as difficult to see as it was to remove, owing to an overhanging epiglottis. The smaller specimen was growing from the junction of the anterior and middle thirds of the right vocal cord. The patient had been twice anæsthetized and an attempt made to remove the growth by the direct method.

DISCUSSION.

The PRESIDENT said he took it that the case was brought by Mr. Tilley to remove any idea which might have been formed from previous comments that he had abandoned the indirect method.

Mr. HERBERT TILLEY said he had brought these specimens to show that he had not given up the indirect method. These two cases came before him within ten days of each other, and were interesting. The larger specimen was in the anterior commissure, and only by pulling forward the epiglottis could a vascular, bluish-looking fibroma be seen in the commissure. The patient was brought to him with the idea of discussing the question of general anæsthesia and the direct method. He applied 20 per cent. of cocaine to the epiglottis and larynx to see if it was possible to pass the forceps into the larynx. The forceps were Whistler's, and they immediately closed on to the growth, and he therefore removed it at once. The cases were shown to demonstrate that he was not opposed to the indirect method and that his attitude in the matter was that of eclecticism.

Professor KILLIAN said that when he was in New York a case was shown to him which was very difficult to examine, and he was unable to see anything. But along the instrument from Reichert he could see a polyp, very deep in the anterior commissure, and removed it. In some cases it was a very good plan to remove a polyp from the vocal cord direct. There were cases which were particularly suitable for suspension laryngoscopy.

Sir FELIX SEMON said he was glad that their honoured guest and Corresponding Member, Professor Killian, had declared there, publicly, that he still removed the greater number of the laryngeal neoplasms he had to deal with by the indirect method; and he hoped that declaration would be an inducement to junior members not to resort to the newer method to the exclusion of the older. His own early operations dated back to a time long before the employment of cocaine; patients had then to be very laboriously prepared by the introduction of probes, sometimes for weeks, before they became sufficiently tolerant to allow of the necessary operation to be performed. Reference to the *Medico-Chirurgical Transactions* would show that in some cases he had removed growths which were generally believed to be inoperable intralaryngeally. After some practice he had not found the indirect method very difficult, and he would particularly remark that in not a few cases he had found the growths in the anterior commissure the very easiest of all to remove. He had done this by leaning, with some force, on the lower branch of the forceps against the anterior wall of the larynx. This gave a good deal of help. He devoutly hoped that the indirect method would not become a lost art.

Sir STCLAIR THOMSON, in welcoming Professor Killian there to-day, said that his too enthusiastic pupils were more Killianische than Killian himself.

He would repeat what he said at the former meeting of the Section—viz., that neither Professor Killian nor Professor von Eicken took up the direct method to operate on the larynx if they could use the indirect successfully. Like Sir Felix Semon, he had found it not impossible to operate in the anterior commissure. During twenty years he had not come across a laryngeal growth in an adult which he had not removed to his complete satisfaction by the old, indirect, method. He had more than once recommended Horsford's suture for holding up the epiglottis. Like Sir Felix Semon, he agreed that there was a certain knack in using these things: and many would agree that it would be a deplorable day when Mackenzie's forceps were given up. They had been objected to on the Continent and in America by those who had not used them because they looked clumsy, and were at an old-fashioned angle. There was a certain degree of tactile appreciation which could be acquired with these forceps. He had sometimes got hold of a growth, and when the patient made a little movement, the sensation told him he had grasped too much, and he had let go and waited, and secured a fresh hold. It was a great thing to have Professor Killian present to give help concerning the indications, because both methods had their indications.

Dr. DUNDAS GRANT said he could endorse the remarks of Sir Felix Semon, for it was astonishing how easily these growths in the anterior commissure sometimes came into the forceps even when one scarcely expected it: one caught the growth in a sort of antero-posterior grip. He had found Whistler's forceps most useful; there was something extremely convenient about the little double spoons with which the tips were provided. For lifting the epiglottis he pinned his faith to the Mount Bleyer lever, which acted on the same principle as the one shown by Professor Killian. In the case, however, of small children under a general anæsthetic, one had in suspension laryngoscopy an ideal method of dealing with difficulties which had hitherto proved practically insuperable.

Mr. CYRIL HORSFORD said he first recommended the use of the epiglottic suture in a little article in 1908, in which he said it was a plea for the survival of the fast-dying indirect method. So he was interested to hear, even six years later, such an interesting discussion on the subject. In a second paper, in which he set forth his later experiences, he illustrated the point by reference to one case, which was a difficult one. It was a small growth on the anterior half of one vocal cord. Numerous attempts were made, with various instruments, and there were two attempts by the direct method, once under a general anæsthetic. After those he succeeded, by means of the epiglottic suture, in removing the growth in the ordinary way. That showed that these growths were more easily removed by the indirect method, particularly if aided by the suture.

Dr. FITZGERALD POWELL said he was very pleased to note the support that was given to the old methods by such eminent authorities, especially after the onslaught that had been made on the indirect method of laryngeal examination and operation. At the last meeting of the Section much had been justly said in favour of the epiglottic suture, in operating on growths in the anterior commissure; he would also like to mention laryngeal forceps introduced by Lambert Lack, and a modification of Mackenzie's forceps by himself, in which the cutting blades of the forceps were turned back towards the operator and enabled him to seize the growth very readily in the anterior commissure.

The PRESIDENT said he also could speak from an experience with Horsford's suture, and he much preferred it to the ordinary epiglottis elevator, because it could, so to say, regulate itself. One had only to attach an artery forceps to the suture and allow it to hang out of the patient's mouth, and that produced enough drag on the epiglottis to lift it up. But instruments differed in individual hands.

Dr. DAN MCKENZIE remarked that what the seniors had said was true, and their remarks had been very interesting, but he feared many of the younger men would go away from the meeting and still do what they had been doing for a considerable time past—namely, remove most, if not all, small tumours in the larynx by the direct method. He, of course, said that with trepidation in the presence of masters in laryngology, but he felt that, in honesty, it was for one of the younger men to give utterance to what he was now saying, for they could look back on a good many tumours difficult or impossible to remove by the indirect method which, to their great surprise, they could easily get away by the direct. He would like to repeat one remark which he heard made by a pathologist whose clientèle lay largely among laryngologists, that previous to the introduction of the direct method a large number of the specimens submitted for his opinion consisted of healthy laryngeal mucous membrane, but since the direct method was used practically all the laryngeal specimens submitted consisted of pathological tissue.

Case which illustrates the Successful Endonasal Treatment of Unilateral Pansinusitis.

By HERBERT TILLEY, F.R.C.S.

MISS C., seen February 7, 1913. Pus found in right frontal, ethmoidal, and sphenoidal sinuses. Duration of discharge probably about eighteen years. Antrum freely opened in Vienna in 1907. Last May I drained the frontal sinus by the intranasal method as outlined at the last meeting of the Section, and also removed diseased ethmoidal cells and drained sphenoidal sinus. The large opening in the latter is very obvious and the nasal cavities are free from purulent discharge.

The PRESIDENT said the case illustrated very well the points which Mr. Tilley put forward at a recent discussion. Dr. Perry Goldsmith, of Toronto, would show a specimen bearing on frontal sinus conditions.

(*a*) Two Curettes for the Removal of the Anterior Ethmoidal and "Agger" Cells. (*b*) A Collection of Foreign Bodies removed from the Lower Air Passages and Œsophagus. (*c*) Skiagrams illustrating Foreign Bodies in the Bronchi and Malignant Strictures of Œsophagus.

Shown by HERBERT TILLEY, F.R.C.S.

MR. TILLEY said he showed these specimens of foreign bodies to-day as a compliment to Professor Killian, so that he might see how much British laryngologists were indebted to him for methods of dealing with these conditions, and that they were not slow to profit by his teachings in this country.

Intranasal Frontal Sinus Operation.

By P. WATSON-WILLIAMS, M.D.

PATIENT shown on whom the intranasal frontal sinus operation had been performed by the exhibitor's method of anterior entry, the frontal sinus septum being deliberately broken down to afford free communication between the sinuses. Skiagrams were also shown of patients operated on intranasally for frontal sinus operation.

Specimens obtained from a Case of Laryngo-fissure for Epithelioma of the Right Vocal Cord.

By E. D. DAVIS, F.R.C.S.

PATIENT was a healthy old soldier, aged 76, who complained of hoarseness, and a sense of obstruction, during breathing, of nine months' duration. The laryngoscope showed a circumscribed ulcerating growth involving the anterior one-third of the right vocal cord and ventricular band, extending on to the anterior commissure, with limitation of movement of the cord. A piece of the growth removed by the indirect method for section completed the diagnosis of epithelioma. There was no glandular enlargement, the urine and sputum were normal.

On April 17, with chloroform anæsthesia, the larynx was opened, and the growth widely removed with the anterior one-third of the left cord (*see* bottle specimen). With the exception of difficulty of swallowing the patient did well, but on the seventh day after operation he collapsed and died from heart failure.

The post-mortem specimen of the larynx, with diagram of operation, is shown, also a histological section of the growth. The lungs and kidneys were normal, but there was no sign of repair or healing of the larynx.

DISCUSSION.

Sir StClair Thomson said it was unfortunate for Mr. Davis and for members of the Section that this patient's recovery was interrupted, because the operation was beautifully performed, as was evident from the post-mortem demonstration of the larynx. By the diagram Mr. Davis showed exactly how malignant disease of a vocal cord should be removed. He understood that Mr. Davis, after he exposed the larynx, made his incisions round the growth, and he would like to know whether Mr. Davis was satisfied with that, whether there was not much hæmorrhage, and hæmorrhage which was difficult to check, and also whether he did not lose his bearings a little. For the last six years he (the speaker) after splitting the larynx and getting the vocal cords into view, had done a sort of submucous resection, making a periosteal detachment, commencing close up to the laryngo-fissure in front, and undermining the whole part upwards and downwards and right back, until one could not get any farther—viz., to the vocal process of the arytænoid. He then clipped the growth below with curved scissors, clipped it above, and round at the back. Mr. Davis had done well to go far beyond the growth posteriorly; he had not only taken off the vocal process of the arytænoid, but also a large part of the arytænoid itself. He asked whether that interfered afterwards with the patient getting rid of his mucus in swallowing, and whether he had to be fed artificially.

Dr. H. J. Davis said he did not understand why these patients were not fed by the rectum; there was no necessity to give them water to drink or to feed by the mouth at all. A patient could be kept alive well for ten days by means of nutrient enemata. After operation of thyro-fissure recently, he gave the patient nothing by the mouth for ten days, and his only complaint was that he felt rather thirsty; he did not complain of hunger. But there must be enough nourishment given in that way to keep up the strength of the patient. When the patient was on his back and was fed by the mouth, some food was very apt to get down into the lung and set up septic troubles, and this is what these patients usually died from.

Sir FELIX SEMON said he had operated on many of these cases, and was the first to advise how the after-treatment should be carried out, after the late Sir Henry Butlin had given his first excellent directions. He had fed his patients from the second day, if not even from the first, by the mouth, but he took care to place the patient in horizontal position on the operated side, with the head hanging slightly over the edge of the bed, when the food was taken, and the nozzle of the feeder was introduced into the dependent angle of the mouth. He had not lost a single patient from septic pneumonia which could be traced to that method, and he recommended those who were beginning these operations to follow it. He also raised the question whether it was necessary to give patients adrenalin at all. He doubted the wisdom of it. An early experience of his was that he had lost a patient from secondary hæmorrhage after the use of adrenalin. No doubt it was nice to be able to do a bloodless operation by not merely cocainizing the larynx, but also giving adrenalin; but in the case he referred to some blood must have got into the lung, for the patient got pneumonia and died from it. He emphasized the advice he gave twenty years ago—viz., to make the first incision round the growth *below* it, so that if there were much bleeding it would not obscure the second semicircular cut. Otherwise bleeding might so obscure matters that the operator would not be able to tell whether, in his subsequent cut, he had been keeping a sufficient margin of healthy tissue round the growth.

Dr. FITZGERALD POWELL said he was glad Sir Felix Semon mentioned the point about adrenalin, as his own experience confirmed that of Sir Felix. In one or two of his cases there was considerable hæmorrhage before the wound was closed, and in one very bad secondary hæmorrhage, and that was after adrenalin had been used. After reading Sir Felix Semon's opinion, he gave up the use of adrenalin, and had not had a repetition of that trouble. He took care not to close the wound until all the bleeding had stopped. One could get a good view after swabbing with cocaine.

Mr. E. D. DAVIS replied that when he opened the larynx he used a good deal of cocaine and adrenalin. His object was to get the growth from the back —i.e., by a deep incision behind the growth and approach the two incisions forward above and below. But that he found difficult. He then started to dissect the growth from the thyroid cartilage from before backwards. He then pulled on the growth, and believed he pulled a little too hard, because there was a strip of mucous membrane detached from the arytæno-epiglottidean fold. He afterwards divided the mucosa, arytænoid and vocal process with scissors. His object was to take the growth from the depths, so that the blood should not obscure his incision at the back. He plugged the larynx above and below before commencing his incision. There was considerable difficulty in swallowing. Twenty-four hours after the operation he gave the patient some sterile water to drink in order to see how he could swallow, but the water came through his tracheotomy wound. He therefore gave up the idea of feeding by the mouth, and passed a nasal tube for the purpose. He was practically fed by a nasal or œsophageal tube until his death. With regard to the removal by indirect method of a piece of the growth for section, the pathologist was not satisfied with the amount of growth he received for examination: there was not enough to be sure of its nature.

A Case of Gummatous Ulceration of the Larynx.

By E. D. Davis, F.R.C.S.

A PUBLICAN, aged 38, was first seen in June, 1913, for hoarseness, stridor, and slight laryngeal obstruction. He had received eight intramuscular injections of salvarsan and was taking mercury, but could not tolerate potassium iodide. Wassermann reaction positive. Sputum: No tubercle bacilli. A sketch of the larynx at this stage is shown. In spite of two more intramuscular injections of salvarsan the laryngeal obstruction increased, and on August 29 tracheotomy was performed. An intravenous injection of 0·9 grm. neo-salvarsan was given, and subsequently, by suspension laryngoscopy, the excess of granulation tissue was removed by curette and forceps. Rubber tracheotomy tubes were used, and after the curetting the tubes were button-holed to allow air to pass through the larynx. The patient repeatedly coughed up small sequestra of ossified cartilage, even before any laryngeal treatment was commenced, and on one occasion a sequestrum (the complete left arytænoid cartilage) was discovered in the button-hole of the tracheotomy tube. (Sequestrum shown.)

A second intravenous injection of 0·9 grm. neo-salvarsan was given, and a negative Wassermann reaction obtained ten days later.

The tracheotomy tube was removed at the end of ten weeks, when the larynx had healed. The patient is now taking "tabloids" of iodide and mercury.

The PRESIDENT said the case illustrated the undesirability of assuming that because a patient had had a certain number of salvarsan injections he was necessarily cured of his syphilis. Recently he had a case brought to his notice which had had salvarsan injections, and the Wassermann reaction was negative. An insurance policy was granted by an office for a large amount, on a certificate being produced that his Wassermann reaction was negative. Two years afterwards tertiary manifestations of syphilis had occurred in the form of ulceration of the pharynx, and the Wassermann reaction was positive. That patient also, like Mr. Davis's, was very intolerant of iodide, but he bore the "tabloids" of iodide and mercury very well, and the ulceration rapidly healed under that treatment.

A Case of Gummatous Perichondritis.

By E. D. Davis, F.R.C.S.

A woman, aged 28, complained of hoarseness and difficulty in breathing for one week. An examination showed considerable swelling of both ventricular bands. The glottis was filled by the swelling, with the exception of a small triangular interval between the arytænoids. Some thickening of the alæ of the thyroid was palpable. Wassermann reaction positive. An intravenous injection of 0·9 grm. neo-salvarsan was given on April 28, with marked reduction of the intralaryngeal swelling, so that it was possible to give potassium iodide and mercury.

A Case of Advanced Laryngeal Tuberculosis treated by Tracheotomy and Curetting.

By E. D. Davis, F.R.C.S.

A cabinet-maker, aged 39, who had been treated at Mount Vernon Hospital for pulmonary and laryngeal tuberculosis, developed laryngeal obstruction requiring tracheotomy. The glottis was filled by granulation tissue arising from both ventricular bands and from the interarytænoid region. Tracheotomy was performed three months ago with morphia and scopolamine, and a local anæsthetic of eucaine and adrenalin solution, 4 per cent. At a later date the granulation tissue was removed with forceps and a straight Heryng's curette with suspension laryngoscopy. The patient has received small doses of tuberculin.

Mr. E. D. Davis, in reply to the President, said the patient had very advanced pulmonary tuberculosis, and the tracheotomy became imperative owing to the patient's dyspnœa, restlessness, and inability to sleep at night. Though the larynx was now fairly free it would be inadvisable to leave out the tracheotomy tube.

Specimen showing Absence of both Frontal Sinuses and Fronto-nasal Ducts.

By PERRY GOLDSMITH, M.D.

DR. GOLDSMITH said the specimen he had to show might not be so unusual to members of the Section, with their large experience, as it was to him. He had every reason to think that the skull shown was that of a Canadian Indian, and there was a complete absence of both frontal sinuses and fronto-nasal ducts. The absence of one frontal sinus was not unusual. In the usual position for the fronto-nasal duct there was no communication whatever.

DISCUSSION.

Dr. DONELAN asked whether Dr. Goldsmith could communicate any points about the history of the case. From where he sat he had been unable to follow all the exhibitor's description, but the specimen reminded him of a case he (Dr. Donelan) had shown here in which a previously operated frontal sinus was found filled up with bone when an attempt was made to re-open it a year later. This specimen looked as if pre-existing sinuses had become filled up as the result of disease or trauma.

Dr. PERRY GOLDSMITH replied that he was sorry not to be able to give any points in the history, as the possessor of the skull had been dead probably four or five hundred years. He was not prepared to dispute the suggestion that in this case also there had been osteo-myelitis. But he had gouged away the diploë and there was no suggestion of any communication, nor anything which anyone, even in his most enthusiastic moments, could call a high ethmoidal cell. He expressed his pleasure at having been privileged to be present at the meeting and to participate in it.

? Malignant Disease of Larynx.

By DAN MCKENZIE, M.D.

THE patient is a man, aged 42. He came to hospital complaining of a pain in the right side of his throat "as if a tooth-brush bristle was sticking into it." In the larynx some irregular papillomatous outgrowths were seen in the interarytænoid region rather towards the right side.

Both cords were red, and the movement of the right cord distinctly impaired. There was also visible a small ulcer involving the posterior end of the right cord; and the interarytænoid region, especially on the right side, showed considerable infiltration and swelling. There is no history of lues, and the Wassermann reaction is negative. Portions of tissue have been removed by the direct method for microscopic examination, the result of which will be reported at the meeting. The patient has a large soft goitre.

? Tertiary Infiltration of the Larynx simulating Malignant Disease.

By DAN McKENZIE, M.D.

THE patient is a male, aged 56. The larynx shows general nodular outgrowths and bosses in the region of the left ary-epiglottic fold, the left ventricular band and the posterior part of the left cord. Here also some ulceration is visible, and the movements of this cord are distinctly limited. The condition is most easily seen on direct examination in Mouret's position. Pieces have been removed for microscopical examination and the report will be communicated to the meeting. The Wassermann reaction is doubtfully positive.

DISCUSSION.

Dr. DAN McKENZIE said the first case had been proved definitely to be tuberculosis. With regard to the second case, Dr. McKenzie said the microscopical examination showed giant cells, but the pathologist hesitated to diagnose tubercle, and equally hesitated to say it was syphilis. There were no signs of endarteritis.

Dr. DUNDAS GRANT said this kind of horn-shaped outgrowth was more common in tertiary syphilis than in connexion with any other disease. He presumed it was not an artefact condition produced by energetic use of the forceps, and was most probably syphilitic.

Piece of Rabbit Bone removed from Larynx by Suspension Laryngoscopy.

By DAN MCKENZIE, M.D.

THE patient is a girl, aged 2, who came to hospital with severe laryngeal stridor. About three months ago the child suddenly seized a piece of rabbit flesh from its mother's plate and bolted it. Asphyxia at once set in, but a neighbour woman contrived to hook the meat out of the child's throat with her finger. Immediately afterwards the breathing became perfectly natural and the child seemed to be quite well, but the next morning laryngeal stridor had developed, and the mother took the patient to a hospital. Since then the child had successfully weathered an attack of bronchitis, although the laryngeal obstruction remained unchanged during the whole of that time. During this illness ordinary swallowing was found to be impossible, and the child was fed by a nasal tube.

The conclusion arrived at by the exhibitor was that while the rabbit flesh had been removed probably a bone had been left behind, and on that assumption tracheotomy was performed without an anæsthetic, as the breathing was very much obstructed, and then the interior of the larynx was searched under suspension laryngoscopy. It was impossible to see any foreign body, and a difficulty was experienced with the epiglottis, which kept falling back and for this the epiglottic retractor furnished with the suspension laryngoscopic apparatus seemed to be of no value whatever. However, by means of a long probe the epiglottis was held up with the one hand while the forceps were passed with the other. After one or two vain attempts, in the course of which the rough grating of a foreign body could be felt about the neighbourhood of the glottis, the foreign body was seized with the forceps, rotated gently to free it from its connexions, and removed.

The patient was brought on May 22, and the operation took place on May 23. The subsequent condition of the patient will be reported at the meeting.

Later Note.—The tracheotomy tube has been removed and the patient discharged from hospital well.

Osteomyelitis of the Superior Maxillary Bone and Maxillary Antral Suppuration in a Child, aged 11 months at the time of Operation.

By W. Stuart-Low, F.R.C.S.

The child was sent to the hospital as an urgent case from the Royal Ophthalmic Hospital, where it had been taken as an eye case. The eyelids were greatly swollen, and presented the appearance seen in cavernous thrombosis. A free incision was at once made on the face underneath the eyelid, and a quantity of pus evacuated. Another incision forty-eight hours after was made in the gingival fold and some pus found. On reflecting the cheek carious bone was discovered and scraped away; this was twice repeated with good results.

Photograph and temperature charts shown.

Dr. Brown Kelly said this condition was at one time called empyema of the antrum in infants. Some years ago he wrote a paper[1] on the subject, pointing out that the antrum in infants was very small, while the dental sac of the first molar was comparatively large. Judging from the published cases, and the three or four he had met himself, it would appear that the disease was due to a primary inflammation of the dental sac of the first molar, caused by traumatism or infection, which subsequently extended to the superior maxilla.

Girl, aged 5, from whose Nasopharynx a Large Spindle-celled Sarcoma was removed six weeks ago.

By W. Stuart-Low, F.R.C.S.

Specimen and microscopic slide also shown.

DISCUSSION.

The President said the removal had been very successful. Mr. Stuart-Low had stated that the pathologist reported it as a large spindle-celled sarcoma.

Dr. Dundas Grant said this was one of the conditions which simulated adenoids. A number of years ago Mr. Waggett reported that he had found that sarcoma in the nasopharynx was of more frequent occurrence than was generally supposed. He would like to know whether that experience had been continued to the present time, or was founded on such a series of coincidences as was met with from time to time in medicine.

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[1] *Edin. Med. Journ.*, 1904, n.s., xvi, pp. 302-15.

Mr. WAGGETT, replying to Dr. Grant, said that when he made that remark he had had three similar cases in a fortnight, but that his experience of late years had not confirmed his early impression.

Case of (?) Rhinoscleroma.

By J. DUNDAS GRANT, M.D.

THE patient, a man, aged 32, complains of discomfort in the throat and obstruction in the nose of eight months' duration. The fibro-cartilaginous portion of the nose has gradually swollen and it now feels as if infiltrated with hard paraffin. There is a deflection of the septum to the right, an irregular softish thickening on the left and a soft fibrous outgrowth half-way back. The roof of the soft part of the nose is covered with a shiny varnish of sticky mucus. The soft palate is thickened and the upper part of the posterior pillar attached to the posterior wall of the pharynx by a fine cicatricial adhesion. The edge of the right half of the palate is the site of pale papillated ulceration; the finger, introduced behind the palate, feels a dense resistance as if the tissue were infiltrated with a substance of the density of hard rubber. The larynx is irregularly thickened and presents some of the appearances of tuberculosis. The obstruction to laryngeal respiration is only slight. There is a considerable amount of inspissated sticky secretion. There are no signs of tuberculosis and bacilli are absent. Wassermann's reaction has already been taken and found negative.

The patient is a Russian from the province of Minsk and has been eleven years in this country. His wife and children are in good health.

The outgrowth from the left side of the septum is at present being cut for microscopical report, and a culture is being made from a scraping from a fresh cut surface.

DISCUSSION.

The PRESIDENT said the case reminded him of one or two he had seen in Stoerk's clinic in Vienna years ago.

Dr. BROWN KELLY thought that the case was rhinoscleroma.

Case of Carcinoma of Maxillary Antrum; Operation and Removal of Glands.

By W. M. MOLLISON, M.C.

E. C., AGED 44, attended Guy's Hospital in December, 1913, complaining of bleeding from the left side of the nose for four months. She had been in an infirmary for three weeks on account of the bleeding. but left there one month previous to her attendance at Guy's. She had considerable pain in the left side of the face and about the left eye and in the temporal region; there was some tenderness over the superior maxilla. She had wasted "very much."

On examining the nose there was much obstruction on the left side, and this was seen to be due to a pinkish mass resembling granulation tissue, which appeared to come from the region of the middle turbinal. There was some pus about the granulations, and some septic teeth in the upper jaw. A provisional diagnosis of carcinoma was made and confirmed by the microscopical examination of a piece removed from the nose.

Operation was performed in January of this year. Moure's incision was made, and the cheek turned down, thoroughly exposing the maxilla. The growth was found to have broken through the anterior wall of the antrum, and to have invaded the tissues of the cheek. The anterior wall of the antrum was entirely removed, and the cavity found full of growth; but, as far as could be seen with the naked eye, the bone itself was not invaded on the floor or roof. The lining membrane stripped off well. The whole of the outer wall of the nose was removed, and the ethmoid as high up as the cribriform plate. Recovery was uneventful.

The operation was greatly facilitated by the administration of ether by intratracheal insufflation—kindly given by Dr. Shipway—there being no anxiety in regard to blood passing into the larynx.

About six weeks later a second operation was performed to remove the lymphatic glands from the left side of the neck. Unfortunately, the wound became infected through saliva running over the chin, and extensive suppuration followed; however, owing to the most painstaking attention of her dresser it eventually healed well. Microscopically the glands proved carcinomatous.

As a result of the operation the patient is much improved; she has lost her pain, and at present has no recurrence, though, of course, it is only a short time since operation.

DISCUSSION.

The PRESIDENT said Mr. Mollison was to be congratulated on the excellent result in this case, and asked whether he was satisfied that the administration of the ether by the intratracheal method was suitable for such cases. Did that method block up the larynx entirely and prevent blood entering?

Dr. PETERS asked whether the intratracheal administration of ether was effective in this case to check entry of blood into the trachea.

Dr. H. J. DAVIS said that at his hospital Dr. Phillips had given these patients rectal injections of oil and ether, and did so now for practically every case of bronchoscopy. Children particularly went under it very quickly. The injection was given *per rectum.* On one or two occasions the injections had been made into the buttock, but they were painful, whereas the rectal injections were painless and acted excellently. The child was partly anæsthetized first, and then the rectal injection was given, and the oil massaged up into the colon.

Mr. MOLLISON replied that the intratracheal use of ether was the feature of the operation, and made it much easier than it would otherwise have been, though he quite agreed with Mr. Waggett that these operations sometimes looked more formidable than they turned out to be. The intratracheal insufflation of ether prevented the possibility of any blood passing into the trachea, as the air and vapour were driven in and escaped from the larynx under slight pressure.

Case of Localized Hyperostosis of the Right Superior Maxilla.

By W. M. MOLLISON, M.C.

P. J., AGED 9, attended Guy's Hospital on May 5, 1914, complaining of swelling of the right cheek and right-sided nasal obstruction, noticed for the last four months. There is swelling of the nasal process of the right superior maxilla; this feels bony. There is complete right-sided nasal obstruction and the inferior turbinal is seen to be the cause of that obstruction. X-ray examination shows "enlargement and abnormal density of the right superior maxilla" (plate shown). The dental surgeon saw the boy and found three carious teeth, but did not consider these had any connexion with the swelling. The Wassermann reaction is "strongly positive."

REFERENCE.

HUTTER. "Ueber Hyperostosen der Gesichts-und Schädelknochen und die 'Hyperostosis Maxillarum,'" *Monats. f. Ohrenheilk. u. Laryngo-Rhinie*, 1914, Heft 2.

Case of Paralysis of both Superior Laryngeal Nerves in a Man, aged 25, occurring in the course of Disseminated Sclerosis from Lead Poisoning.

By JAMES DONELAN, M.B.

IN view of the great rarity of reports of this lesion the exhibitor has been requested to bring the case forward again on this occasion. The patient shows all the distinctive symptoms, including loss of sensibility of the mucous membrane, the crico-thyroid space is unchanged on phonation, the voice is rough, low in pitch, monotonous—the slight change in pitch that can be produced cannot be maintained. The laryngoscope shows that the cords remain slack on phonation; the wavy line can be elicited on gentle phonation, but increased effort blows the cords loosely apart. At first the anterior commissure used to be turned towards the right, the right muscle having been first affected, now it lies in the middle line. On inspiration the slack cords completely disappear beneath the ventricular bands.

DISCUSSION.

Dr. DAN MCKENZIE asked whether it was an accepted fact that disseminated sclerosis was sometimes due to lead poisoning.

Dr. DONELAN replied that disseminated sclerosis was pre-eminently an intoxication neurosis affecting chiefly young adults. The infectious fevers were a common cause and as regards Dr. McKenzie's question he believed that Oppenheimer had reported twenty-eight cases in which a large proportion had been traced to the influence of lead, zinc or copper. Part of this man's work was to clean the type cases at a printer's, when he probably inhaled the lead-bearing dust. The fact that "dropped wrist" was not present was made a good deal of in the Court when the case was tried. The necessity of dropped wrist was an old-fashioned view which had its origin at a time when the potteries and house-painters furnished most of the cases in this country. The special tendency to wrist-drop in these callings was now looked on as favoured by the excessive stimulation and blood supply of the overworked centres concerned. The more accurate study of lead poisoning in the last twenty years had shown that the paralyses took the most varied forms and that neither the blue line on the gums nor the wrist-drop were any longer to be regarded as essential or characteristic symptoms.

Instruments for Submucous Resection of the Nasal Septum.

Shown by JAMES DONELAN, M.B.

(1) OPERATING specula for septal or pituitary work. Self-retaining and capable of being fixed in the desired degree of dilatation.

(2) Combined knives and blunt dissectors, to avoid as much as possible changing instruments during operations.

(3) Modified Ballenger swivel knife. The sides of the fork are prolonged as guards so as to diminish the risk of catching in the mucosa when the area of operation travels outside the limits of the speculum. As blades are so often blunted by the osseous portions of the septum they have been made removable. It will be observed that the pivots pass through an oval opening, and that they are hooked in the opposite direction to the line of the cut, so that they grasp the margin of the hole in whatever direction the edge may be travelling.

Carcinoma of Arytæno-epiglottic Fold and Pyriform Fossa removed by Transthyroid Pharyngotomy.

By WALTER HOWARTH, F.R.C.S.

THE patient complained of increasing difficulty in swallowing and a lump in the right side of the neck for five months. Large mass projecting from right ary-epiglottic fold and infiltrating pyriform fossa seen with mirror, and its limits more exactly defined by the suspension method. The growth was removed with a surrounding area of healthy tissue five weeks ago. Preliminary tracheotomy. Large mass of glands removed at a previous operation.

Considerable importance was attached to the following points:—

(1) The mouth was completely cleared of teeth before the operation.

(2) After the growth had been removed an attempt was made to cover in the raw surface by undercutting the mucosa in the post-cricoid region and the region of the epiglottis and sewing over the flaps obtained.

(3) The linear incision in the pharyngeal wall was closed with a double layer of mattress sutures and strengthened by layers of muscle and fascia.

(4) The patient was fed by a nasal tube for four weeks, although the pharyngeal wound was apparently quite healed at the end of a fortnight.

(5) The tracheotomy tube was left in for three days.

DISCUSSION.

The PRESIDENT said Mr. Howarth was to be congratulated on the result; it was an extensive operation, and was thoroughly carried out. He hoped the exhibitor would be able to show the case again in a year or two.

Mr. WAGGETT desired to join in the congratulation to Mr. Howarth, and particularly on his boldness in leaving the vocal cord on the affected side. He was not aware that a similar case had been shown before the Section.

Mr. HOWARTH having thanked the previous speakers for their remarks said that in these cases he approached the growth by the transthyroid route which was first described by Mr. Wilfred Trotter in his Hunterian lectures at the College of Surgeons. This approach had the surgical merit of giving an admirable exposure of the diseased parts and enabling the surgeon to plan the extent of his operation accordingly. He thought that the main difficulty lay in the after-treatment and he laid stress on the five points that he had previously enumerated. In the first case the growth was situated on the outer aspect of the ary-epiglottic fold and then spread outwards into the pyriform fossa. It seemed a pity to remove the vocal cord if it could safely be left behind, and in this case the growth was removed with a good margin of healthy tissue. Careful suture of the pharyngeal wall and feeding of the patient for several weeks with an œsophageal tube were very important. The latter point was well brought out in a case of Mr. Waggett's which was shown a short time ago.

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OF THE

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VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

Section 11

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Medical Section.

October 28, 1913.

Dr. Samuel West, President of the Section, in the Chair.

Syphilis of the Liver with the Picture of Banti's Disease.

By Sir William Osler, Bt., M.D., F.R.S.

From the tangled skein of splenic pathology we have for years been trying to unravel one definite thread, and it looks as if, at least, the attempt had been successful. There is now recognized a disease of splenic origin characterized by:—

(1) Progressive enlargement of the organ, lasting for many years, and not necessarily impairing the health.

(2) Anæmia of a secondary type, with leukopænia, which may come on acutely and recur at long intervals.

(3) A final stage, with cirrhosis of the liver, jaundice and ascites.

That permanent cure follows the removal of the organ, even in long-standing cases and after the jaundice has supervened, is a strong warrant for the belief that the primary lesion is in the spleen itself.

It is a serious difficulty that a motley group of maladies is associated with big spleen and anæmia. From the form just described, which may be called Banti's disease, we have gradually separated off other conditions, such as splenomegaly with acholuric jaundice, splenomegaly of the Gaucher type, splenomegaly with primary pylethrombosis, and certain forms of tropical splenomegaly. Then in a few cases of chronic infectious endocarditis the early history suggests splenic anæmia. Parkes Weber has reported such a case with enlargement of the spleen, and a red blood count of 1,700,000 and a leucocyte count of 1,900.

I have recorded a very similar one, in which the picture of the spleen and the low blood count led to the diagnosis at first of splenic anæmia.[1] No condition is more apt to cause confusion than splenomegaly associated with various forms of cirrhosis of the liver. Occasionally in the ordinary Laennec type the spleen is greatly enlarged, and the anæmia is pronounced. More than once I have been deceived by this picture.

In this brief paper I wish to call attention to a group of cases of syphilis of the liver in which the splenomegaly and anæmia are so dominant that splenic anæmia or Banti's disease is diagnosed. The first case of this kind which I saw was in a girl, aged 22, admitted to my wards in November, 1890,[2] with ascites. She had been a delicate child; had not walked until the fourth year. When aged about 15 she had an obscure illness with trouble in the abdomen, with which she was confined to bed for six months. Ever since the abdomen had been somewhat enlarged. For the past three years she had been fairly well. Her present illness dates from two weeks ago, when she had a chill, headache, and pain in the left side, with fever. She has been at work until two weeks ago.

Condition on admission: The patient was a small, delicately built, anæmic girl, with a very sallow facies. She sat up in bed; was unable to lie down on account of pain. The temperature was 103·5° F., the pulse 120, respirations 36. There was marked deformity of the chest, owing to a flattening of the right side from old disease. The left side of the chest was large and moved very freely. There was a marked curvature of the spine due to the old contraction, following the chronic pleurisy. The abdomen was distended, measuring 78 cm. at the level of the navel. The enlargement was not symmetrical, but was more marked in the left flank and in the hypochondrium. There was also a distinct protuberance in the right hypochondrium. The superficial veins were slightly enlarged. On palpation the abdomen was sensitive, particularly on the left side, and at the edge of the ribs there could be felt a firm mass, which extended nearly to the left inguinal region. Towards the right a sharp edge could be distinctly felt. It was movable on bimanual palpation. There was no question that this was an enlarged spleen. On the right side, occupying the epigastric and hypochondriac regions and the upper umbilical region, there was an irregular firm mass which extended a little below the level of the navel. The edge was rounded and hard. Deep in the right flank and apparently connected with it there were two smaller masses to be felt. These descended with inspiration, and they were thought to be in connexion with an enlarged liver. The inguinal glands were a little larger than normal, and were very firm. The epitrochlear glands were enlarged and firm; the glands in the neck and axilla were moderately enlarged, freely movable, and nowhere matted together. The blood count was: 2,234,000 reds per cubic centimetre, and a ratio of white to red of 1 to 25; hæmoglobin 28 per cent. On November 14 the ratio of white to red was 1 to 16.

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[1] *Interstate Med. Journ.*, St. Louis, 1912, xix, p. 103.

[2] *Johns Hopkins Hosp. Bull.*, Baltimore, 1891, ii, p. 18.

The temperature fell from 103° F. on November 11, and on November 14 was 99·5° F. She complained a great deal of shortness of breath, vomited, and seemed very ill. The urine was scanty, specific gravity 1020, contained a small amount of albumin and a few hyaline casts. The pulse became very rapid. On November 15 and 16 she had nausea and vomiting, became unconscious on November 16, and died early on the morning of November 17.

Autopsy (Dr. Councilman).—The external lymph glands were enlarged and hard. The peritoneal cavity contained 200 c.c. of slightly bloody fluid. The lower border of the spleen was 11 cm. from the ribs. The mesenteric and peritoneal lymph glands were moderately enlarged and hard. Both liver and spleen were surrounded by firm fibrous adhesions. The liver was brownish-yellow in colour, very tough and hard. It was divided into a number of nodular masses from the size of an apple to that of a filbert, some of them almost separated from the liver and only connected with it by a thin pedicle. The greater portion of the liver was made up of an enlarged left lobe. The right lobe was divided up by bands of connective tissue into the nodular masses already mentioned. On section of the liver there were large bands of connective tissue which traversed it in different directions, and from which smaller bands were given off. The largest of these bands ran between the right and left lobes. There were in addition fibrous gummata which projected from the capsule into the liver substance, and in these were hard necrotic areas. The portal vein was dilated to double its normal size. The spleen measured 23 cm. by 16 cm. The surface was covered by slight adhesions, but was otherwise normal. The surface of the section was firm, of a dark purple-red colour. Neither the trabeculæ nor the Malpighian bodies were visible. The organ weighed 1,510 grm. The right lung was small and firmly bound down by old adhesions. In the lower part of the pleural cavity there was a cavity containing 70 c.c. of opaque, gritty, semi-fluid material.

The blood-picture was that of leukæmia. It was before the days of accurate differential counts. A very similar case has been reported by Hoche from von Jaksch's clinic[1] in a girl, aged 20, admitted with the clinical picture of splenic anæmia. With a progressive fall in the red corpuscles there was an increase in the leucocytes, which reached 58,400 per cubic centimetre — 1 to 46 red. The autopsy showed syphilis of the liver.

A very similar picture may be present in acquired syphilis. On December 11, 1897, a man, aged 34, was admitted to the Johns Hopkins Hospital with an enormously enlarged irregular spleen, a red blood count of 1,400,000, leucocytes 7,500 per cubic millimetre. The patient had had syphilis, and three years ago had been in another hospital with jaundice and dropsy, both of which had gradually disappeared. For eighteen months he has noticed the gradual increase of a mass in the left side of the abdomen, and he has become anæmic. The spleen extended beyond the navel and below the level of the anterior superior spine of the ilium. It was freely movable, irregular in shape, the edges rounded, but notches could not be felt. The liver formed an irregular mass in the right hypochondrium, with rounded edges and fissured surface. The picture was very like that of the primary splenic anæmia, but the history and the condition of the liver left, I think, no doubt of the nature of the disease.

For the past four or five years there has been under observation at the Radcliffe Infirmary a boy who, at the time of his death, was aged 11. In 1906 and 1907 we had him in the ward for the examiners for the M.B. as a case of splenomegaly. We did not recognize the nature of the trouble until some three or four years ago, when he was admitted with nodes on the shins and syphilitic arthritis on the left knee. At this time the liver was slightly enlarged and a little irregular, but the blood count was practically normal. The father had died of obstruction of the bowels. The mother had lost several children, but there was nothing to suggest syphilis in the family. The spleen was very large, reaching to the right beyond the navel and below the anterior superior spine. It was smooth, not painful, and the notch could be felt. When first under observation the liver was enlarged and irregular, the left lobe easily palpable. Subsequently the liver decreased in size and the rounded irregular edge could at once be determined. His last admission was under Dr. Collier on Christmas Day, 1912. The following is an abstract of a long history:—

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[1] *Berl. klin. Wochenschr.*, 1902, No. 16.

He looked fairly well. Red blood corpuscles, 5,770,000; leucocytes, 4,640; hæmoglobin, 65 per cent. The spleen was about the same size as on previous admission, filling the greater part of the left half of the abdomen. The liver could not be felt in the middle line. In the nipple line an ovoid, somewhat irregular, smooth tumour could be felt. The fingers could be placed beneath it and the under surface was distinctly irregular. In January the ascites came and increased rapidly, so that he had to be tapped. On February 15 he had bleeding from the gums; on February 23 a severe attack of vomiting of blood. The anæmia then became pronounced, the red blood corpuscles falling below 2,000,000, the ascites recurred, and he had to be tapped several times. On March 11 he had several large bloody stools. On March 12 he vomited twice in large amounts, the spleen became much reduced in size. There was a slight rise in temperature, and during the day he had to be tapped frequently. On February 24 he again had vomiting of blood, and he died on the night of February 27. The Wassermann reaction was negative.

The post-mortem, by Dr. A. G. Gibson, showed (1) the usual features of anæmia; (2) œsophageal varices, from one of which the bleeding had come; (3) a greatly enlarged spleen; and (4) a syphilitic liver, which presented very remarkable features. The left lobe was reduced to a thin flat band; the right lobe was reduced in size, much scarred, fissured, and cirrhotic, with many coarse bands dividing islands of greyish-yellow liver substance. The most interesting feature was the oval mass which was felt during life, as it was attached to the anterior portion of the right lobe, the capsule somewhat thickened; in section the surface was smooth and of a normal, red-brown colour, without a trace of cirrhosis, but there were several small gummata, from about 3 to 4 mm. in diameter. This was really the only normal portion of the organ.

The point which I wish to emphasize in this paper is that syphilis of the liver may present a picture clearly resembling Banti's disease, the splenomegaly, anæmia and hæmatemesis completely overshadowing the hepatic features. The spleen has been removed as in the case of splenic anæmia reported by Dr. S. Coupland.[1] Splenectomy was performed by Mr. Pearce Gould. Two years later the patient died with melæna, hæmatemesis and ascites. The post-mortem showed typically scarred syphilitic liver, with varicose veins in œsophagus and rectum.

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[1] *Brit. Med. Journ.*, 1886, i, p. 1445.

DISCUSSION.

Dr. WYNTER cited a somewhat similar case, due to acquired syphilis, which had been exhibited before the Clinical Section on November 10, 1911,[1] as an example of femoral drainage for recurring ascites. The patient's three children were born alive and survived, and nothing had raised the question of syphilis, but the patient's death two years later revealed a very coarsely lobulated and fibrosed liver (80 oz.) and enlarged spleen, with dilated vein nearly 1 in. in diameter. The liver was exhibited, but no spirochætes had been demonstrated.

Dr. F. PARKES WEBER referred to rare cases of prolonged "tertiary syphilitic fever" which might be mistaken for tuberculosis, malaria, malignant endocarditis, or even typhoid fever, which, however, promptly reacted to antisyphilitic treatment. A case of the kind, which he described in 1907,[2] illustrated on four different occasions remarkably rapid disappearance of the fever on the commencement of antisyphilitic treatment. The patient subsequently (in 1911) developed carcinoma of the cervix uteri. Most cases of "tertiary syphilitic fever" were connected with visceral syphilitic lesions, especially of the liver, although the hepatic disease might be overlooked. Some of these cases probably later on presented permanent changes in the spleen and liver. It would be interesting to know in what proportion of cases with splenomegaly and hepatic changes of syphilitic origin there had previously been one or more periods of "tertiary syphilitic fever." Unfortunately, in cases complicated by jaundice the information derived from the Wassermann reaction for syphilis was unreliable or doubtful.

Dr. NORMAN DALTON said that he had been watching for the last seven or eight years a case of splenomegalic jaundice. There was an enlarged spleen, jaundice of greatly varying intensity, with bile in the stools, and from time to time the patient had attacks of high fever and pain in the abdomen (latterly over the liver), and sometimes intestinal hæmorrhages. The liver showed no signs of becoming cirrhotic. During the attacks death seemed imminent, but up to the present the patient had always recovered. He had considered the advisability of removing the spleen but did not think that the patient would bear the operation. Dr. Dalton had known two cases of extreme oligocythæmia of the aplastic type which had simulated infective endocarditis. In one case under his own care the loudness and variability of the murmurs and the signs suggestive of infarction in the spleen made the diagnosis difficult. The girl, although apparently at death's door on one or two occasions, was now well enough to go to work. He did the post-mortem on the other case and was told that the question of infective endocarditis had arisen. At the post-mortem a few very minute vegetations were found on the mitral valves, but as the sternal bone marrow was absolutely white there could be no doubt that the disease present was aplastic anæmia.

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[1] *Proceedings*, 1912, v (Clin. Sect.), p. 45.

[2] *Lancet*, 1907, i, p. 728, first case.

On Certain Causes of Splenomegaly and Banti's Disease.

(PRELIMINARY COMMUNICATION.)

By A. G. Gibson, M.D.

The view that splenomegaly and Banti's disease may be caused by a parasitic invasion of the spleen is one which, owing to the beneficial effects of splenectomy and treatment by bactericidal substances such as salvarsan, must continually be borne in mind while the ætiology of the group of diseases to which these belong remains obscure. On this supposition the organs of a patient with Banti's disease dying in the Radcliffe Infirmary, Oxford, have been the subject of a very careful inquiry. During life the patient, a female, aged 48, presented the typical features of the disease in the late stages, having an enormous spleen, ascites and anæmia. Post mortem the spleen measured 12 in. long by 7 in. broad and was very firm; the capsule was irregularly thickened. Several infarcts could be detected through the capsule. On section the surface was smooth, pale red, the trabeculæ were evident and the pulp very firm. The infarcts were of the mixed variety. Here and there over the surface were small reddened areas, some of which showed a yellowish pigment, hard but not calcified, arranged in a branching manner along the course of a vein. The pigment could always be found in the vessel emerging from an infarct. The liver was in a condition of early cirrhosis of the monolobular type and numerous miliary tubercles were present. Miliary tubercles were present also in the peritoneum and a few in the lungs. Caseous glands were present in the neck. Tubercle bacilli were present in these lesions and were judged to be due to a terminal infection distinct from the splenic condition, for in the spleen neither macroscopically nor microscopically could anything of a tuberculous nature be found. Cultures from the surface of the spleen on agar remained sterile. Histologically the spleen showed a marked degree of fibrosis not only in the trabeculæ but in that part which was occupied by the pulp. The most evident feature was in the neighbourhood of the veins, where there was extensive fibrosis, much golden-yellow pigment, and a diffuse irregular staining with hæmatoxylin in the immediate vicinity to the wall. A section stained by Wheal and Chown's method [1] shows at once the nature of this indefinite material: what previously took the hæmatoxylin badly now appears as intensely stained black masses and threads, while the tissue nuclei stain red and the cytoplasm of the cells yellow. Under the higher powers the threads are unbranched filaments undergoing segmentation, and in some cases the ends of these filaments are breaking off into bacillary forms. The filaments are massed together into leashes, some being loose and the individual filaments discernible, others being so pressed together that their structure cannot be made out. Fibrous tissue occupies the intervening spaces. The appearance of the threads, their segmentation, their breaking up at their ends, can only be adequately explained as being due to the presence of a streptothrix invasion of the affected parts. By staining methods it has been ascertained that these structures are not fibrous tissue, fibrin, or elastic tissue. They are only Gram-positive to a slight degree in some of the thickest leashes and they are not acid-fast even to 5 per cent. sulphuric acid. No similar structures could be detected in any part of the liver or lungs.

A search through the post-mortem material from the Radcliffe Infirmary, preserved for teaching purposes in the Department of Pathology of the University of Oxford, has been rewarded by finding the same appearances in precisely the same situations as regards the veins, in three other spleens. One was from a male, aged 10½, dying from ascites, an enlarged spleen and a very cirrhotic liver; a second from a male, aged 11, dying from chronic mediastinitis, ascites and a slightly enlarged spleen; and a third from a male, aged 47, dying of cardiac failure, the spleen being somewhat enlarged and showing fibrosis.

By means of the same staining method an equally definite parasitic invasion has been determined in two other spleens, one a portion of an enlarged spleen, fixed in formalin and preserved in glycerine, which had been removed surgically and kindly sent to me by Dr. F. C. Purser, of Dublin, and a second from a male, aged 48, with an enlarged spleen, pulmonary tuberculosis and cirrhosis of the liver, dying in Radcliffe

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[1] *Journ. Path. Bact.*, Camb., 1911, xvi, p. 146.

Infirmary. The first was part of a very much enlarged organ without any definite thickening of the capsule. The section to the naked eye was dark red, showed trabeculæ and Malpighian bodies poorly, but presented small darker areas which appeared to be thrombosed vessels. No infarcts were present. Stained by Wheal and Chown's method, the organ is highly cellular, but here and there are areas with fewer cells in which a brilliantly red network of threads suggesting a mycelium can be seen by the low power. More minutely examined, the threads composing this network are irregular in size and show thickenings and expansions : the red staining fails sometimes so as to suggest a segmentation, which, in places, actually takes place. At the periphery of the area an occasional club-shaped thickening terminates a projecting fibre. The second spleen has a similar naked-eye appearance, and the same structures have been found both here and in the lining of one of the lung cavities. Tubercle bacilli were also found in the lung lesions. These structures are Gram-positive, but not all fibres and sometimes not the whole fibre. They are not fibrin, because with this stain the fibrin in the vessels does not take any of the red colour, neither are they elastic or fibrous tissue.

It is submitted that the appearances here described admit of the view that these structures are streptothrix organisms and the cause of the pathological conditions in the spleens examined. The negative results from culture are not against this, for it is well known that some of these organisms are difficult to grow on ordinary media ; moreover, the cultures were taken before attention was directed specially to the neighbourhood of the veins. Finally, the frequency of infarcts agrees with the observation that the parasitic structures, at least in four of the cases, lie in the walls of the veins and in the immediate neighbourhood.

A Contribution to the Study of a Group of Cases of Chronic Recurrent Diarrhœa in Childhood.

By F. J. Poynton, M.D., R. R. Armstrong, and
D. N. Nabarro, M.D.

In bringing forward this paper we feel that we ought to explain that only the gravity and particular interest of the group of cases and the fact that we have some pathological data of value with regard to them, has encouraged us to embark upon such a well-known subject as the occurrence of diarrhœa in childhood. The group of cases we are dealing with seems to us clinically to be a definite one and we will introduce the subject by a brief outline of some of the chief features as they have impressed us.

The first illness is usually a gastro-enteric attack in infancy, the result of some alimentary infection or associated with some acute illness such as measles, whooping-cough, or broncho-pneumonia. During this attack there may be some vomiting, but as a rule diarrhœa predominates; the motions may be green or even blood-stained, there is much mucus passed, and later their character is often described as "porridgy." Nourishment is taken badly, but there is often a craving for water. Recovery is slow and tedious, but there is no remarkable fever. Quite early in the convalescence it is discovered that although the child may have taken milk food well before the illness or have managed with ease the ordinary diet of an infant between 1 and 2 years, now the least departure from extreme caution results in an exacerbation of the symptoms. Upon this point we lay much stress, for we have met with examples which, had it not been that they were under our own observations we should hardly have realized that such extreme care could have been needed. To some, milk is especially obnoxious; for others, it is the amount of food or some apparently simple variation in diet designed to improve their weight and strength, or lastly some obvious but slight error that may bring about the speedy relapse. Clearly associated with this is the extreme liability to such relapses after what has seemed to be a comparative recovery. Though usually due to diet, they may also follow a chill or over-fatigue. Whatever the cause, this is abundantly clear, that however trifling the exciting factor, the illness will be prolonged and intractable.

When the condition has existed for some years there is a decided resemblance in the appearance of these children. They are anæmic, soft, and very weak on their legs. The abdomen is large and tympanitic and in bad cases infantilism is striking. One extreme case in adult life at the age of 24, seemed like a girl of 16 years, and though quick and shrewd was stunted and childish in frame. We can hardly wonder that such a result occurs when we mention that one of our cases weighed 24½ lb. at 11 months, 17 lb. at 2 years, 17¼ lb. at 3 years, and 25½ lb. at 4 years of age.

Diarrhœa is not always constant in any particular attack; there may be also intervals of constipation which may be associated with alarming meteorism and cardiac failure. The stools then are often quite colourless. We have never observed jaundice or even a suggestion of its occurrence in any of our cases.

With this brief introduction we turn now to our clinical details. The first case, a fatal one, is the one which has chiefly led us to make this contribution, and had been followed for some years both in the out-patient and in-patient departments of the Children's Hospital.

We are indebted to Dr. A. E. Garrod for the use of the notes of the case while under his care.

Case I.—A. H., male, aged 9 at the time of his death, had an attack of enteritis when aged 1, which lasted eight months and was associated with severe diarrhœa and abdominal swelling. In this illness he was treated at the Tottenham Hospital. He was one of seven children, another dying as an infant of diarrhœa. He came first to the out-patient department on July 11, 1908, when aged 5, with a history of an attack of diarrhœa which had already lasted three months. At its worst blood had been passed and the motions were green. In the last weeks there had been sickness. He was wasted and pale. His tongue was clean and moist. His weight was 27 lb. The abdomen was slightly distended but no masses could be felt. The spleen was not enlarged but the liver could be felt 1½ in. below the costal margin. The stools were large, light brown, soft, and offensive. The lungs and heart showed nothing abnormal. His temperature rose once to 101° F. The provisional diagnosis of abdominal tuberculosis had been made, but Calmette's reaction was negative. Improvement was rapid with a milk diet and rectal lavage, salicylate of bismuth and opium, and he left at the end of the month for the convalescent home, where he remained another four weeks.

He was readmitted on December 5, 1908. Ever since his return home the stools had been loose and diarrhœa with rapid wasting had recommenced six weeks before admission. The boy looked very ill with dark rings under his eyes and was emaciated. A few enlarged glands were felt in the upper intercostal spaces. The abdomen was slightly distended and tender. The liver as before was enlarged. His weight was 30½ lb. The urine (specific gravity 1014) contained a faint trace of albumin. The temperature was normal. This attack was more severe and there was daily vomiting. Calmette's reaction was again negative. The motions were at first four daily and then were reduced to two daily. Gastric and rectal lavage and lactobacillin brought about a gradual recovery in six weeks.

He was readmitted again in August, 1910, after an interval of about eighteen months, and remained until September 8, and again from October 27 to November 5. On each occasion there had been a recurrence of diarrhœa with watery, light brown, offensive motions. There was extreme emaciation and he had a cadaveric appearance. His teeth, previously good, had now become much decayed. His abdomen was large and distended and some fæcal masses could be felt. His weight was now 31 lb. The diet was milk, cream, rusks and custard. It was clear now that the condition was gaining upon the patient.

He was again readmitted on February 11, 1911, with the diagnosis of dilated colon or possible abdominal tuberculosis. There was a chronic diarrhœa, three motions a day, with extreme wasting. The stools when formed were white. The tongue was clean. For the first three weeks there was fever ranging between 101° and 99° F., while for four months at the convalescent home it ranged between 99° and 97° F. In other respects no new feature was noted. His weight was now 31 lb. The diet was milk, fish, and chicken.

Once again he was admitted on September 3, 1911, and remained in the hospital until February, 1912. His condition on admission was worse than it had ever been before. A detailed examination of the stools was made by Dr. Graham Forbes, then Clinical Pathologist to the Hospital. They were alkaline and creamy in consistence and colour. Films showed fatty crystals, debris and the following bacteria: (1) Gram-negative bacilli were predominant; (2) Gram-positive diphtheroid bacilli and (3) Gram-positive micrococci were also present. No pus or blood corpuscles were recognized.

Culture: Plate inoculation from dilutions yielded only growth of Gram-negative bacilli in abundance, and colonies subcultured gave most of the reactions typical of the *Bacillus coli communis* group.

In October the diarrhœa had reached nine or ten motions a day and the urine reduced Fehling's solution. The sugar tolerance was tested by administration of glucose 1 dr. every six hours.

On November 7 the reduction of Fehling's solution ceased.

December 2: Mr. Kellock did appendicostomy, after which the large intestine was washed out daily through the wound and 4 oz. of paraffin injected daily through the appendix. The medicinal treatment had been bismuth. Lactobacillin, a pint a day, sanatogen, milk and arrowroot, and a fancy diet were all tried. Improvement after the operation was striking and the weight increased from 27 lb. to 34½ lb. He left the hospital early in February better than he had ever been before.

He was readmitted in July, 1912, after a week's recurrence of diarrhœa and vomiting. This time the stools were noted to be very loose and pale and suggestive of cœliac disease. The ward closing, he had to be sent out again at the end of the month and was readmitted for the last time on August 30, 1912. Diarrhœa had again returned, but without vomiting, and his appearance resembled that of a child in the last stage of septic peritonitis. The temperature was 100° F., respirations 28, pulse 120. Weight 39 lb. The motions were frequent, very watery, offensive, and light coloured. His liver was much enlarged. Vomiting developed after admission, and on September 14 a sudden change for the worse occurred, with the development of severe abdominal pain and collapse. The abdomen, previously distended, became flat, but was not tender. General peritonitis was suspected and exploratory laparotomy done, but the patient never rallied and no explanation was found for the terminal symptoms.

The Necropsy.—The necropsy was made twenty-four hours after death, and we will confine our description to the details that seem pertinent. The appendicostomy had been quite successful. There was no peritonitis nor excess of free fluid and the intestines were not distended. The walls of the large intestine felt thickened, and, on opening it, the solitary follicles were everywhere prominent and the mucous membrane thickened, corrugated, and dotted with areas of very acute congestion. There was no breach of surface, but much mucus coating the membrane. The cæcum and appendix shared in this change. There was general thickening also of the whole small intestine and the valvulæ were prominent, but the Peyer's patches were not enlarged. Between the valvulæ the spaces were sown with raised areas resembling solitary follicles. Diffuse areas of acute congestion were present as in the large intestine. The stomach was also thickened, the mucosa in particular, and in addition was acutely congested, particularly at the pyloric end. The gastric glands were unusually prominent. The lymphatic glands in the mesentery were considerably enlarged, pale and firm on section, as if unduly fibrous. The pancreas appeared natural. The liver was very large, extremely pale and soft, and showed extreme fatty change. The gall-bladder and ducts were natural. The spleen was large, soft and pale. The kidneys showed pale cortices, but these were not swollen. The ureters and bladder were natural. The heart was very small and wasted, the lungs small but natural. No tuberculous glands were found in the thorax. The particular features of the examination were: (1) Thickening of the walls with inflammatory changes affecting the entire alimentary canal; (2) the absence of striking changes in Peyer's patches; (3) the absence of any obvious pancreatic lesion; (4) the abnormality of the liver; (5) the absence of any evidence of tuberculosis.

Microscopy.—As has been described, macroscopic examination post mortem revealed the presence of changes throughout the intestine; microscopic sections of the intestinal wall and of glands associated with the gut confirmed these findings. On a careful examination it was found that, in addition to the more recent and acute changes present—possibly associated with the acute terminal infection referred to elsewhere—there was evidence of damage to tissues over a considerable period of time. As will be seen, not only the intestine but glands secreting into its lumen were affected, and, more remarkable still, changes were present in such remote organs as kidney and spleen. In preparing microscopic sections Gaskell's method of embedding in formalized gelatine was used. Sections were cut on a Sartorius carbon dioxide freezing microtome and stained (1) with hæmalum and eosin to demonstrate general histology and con-

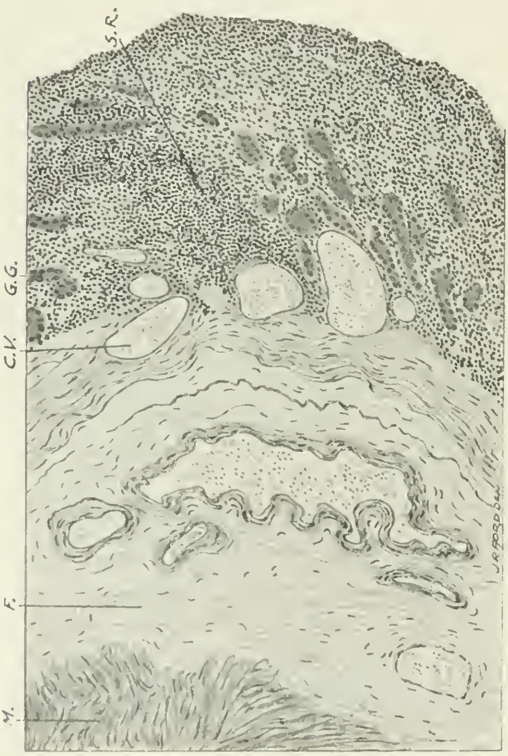

Fig. 1.

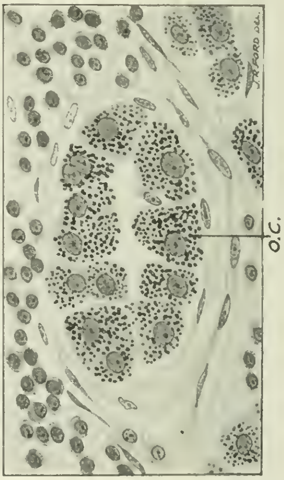

Fig. 1a.

Fig. 1. Section through inner coats of the stomach wall. *S.R.*, cellular infiltration into mucous coat; *G.G.*, gastric glands cut excentrically; *C.V.*, congested blood-vessels; *F.*, fibrous hyperplasia; *M.*, muscle.

Fig. 1a.—A section through a gastric gland, showing fatty changes (*O.C.*) in oxyntic cells.

gestion; (2) with hæmalum and Sudan III to show fats; (3) by Van Gieson's method to show fibrous tissue. The stomach: There was acute congestion of the mucous membrane with here and there rupture of vessels and dehiscence of red cells on to the free surface of the mucosa. There was marked congestion also of the blood-vessels in the submucosa and extremely marked small round-celled infiltration between and amongst the gastric glands. In places the round cells were densely aggregated together into nodes of lymphoid tissue, and from these areas all proper secreting glandular tissue was absent. Such areas were always situated adjacent to zones where the inflammatory changes were most obvious. There was definite increase in perivascular fibrous tissue in the muscular coat. Study under higher magnification of the gastric glands demonstrated the presence of early fatty changes in the oxyntic cells; the fat droplets staining brightly with Sudan III (fig. 1 and fig. 1A).

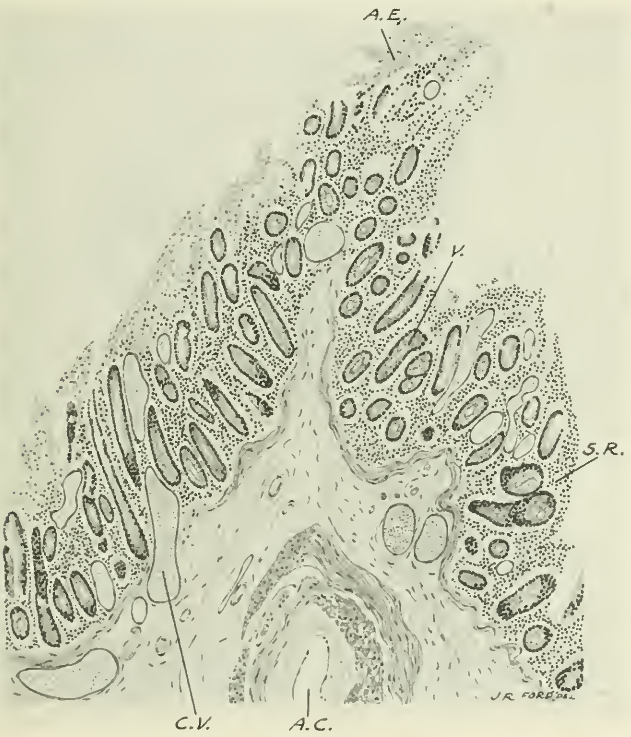

FIG. 2.

A section through mucosa and submucosa of jejunum. *A.E.*, degenerated red cells lying free; *S.R.*, small round cell infiltration; *V.*, villi cut excentrically; *C.V.*, veins congested and dilated; *A.C.*, artery containing blood-clot.

Duodeno-jejunal flexure: Sections again showed very marked congestion of vessels and, in places, slight extravasation, together with marked interstitial infiltration, and here and there, on the free margin of the section, advanced fatty changes in the cells of the secretory glands (fig. 2).

Jejunum showed marked small, round-celled infiltration, prominence of solitary lymph follicles, and congestion and hæmorrhage on to the free surface of section. Altered red cells were seen staining somewhat diffusely purplish with hæmalum.

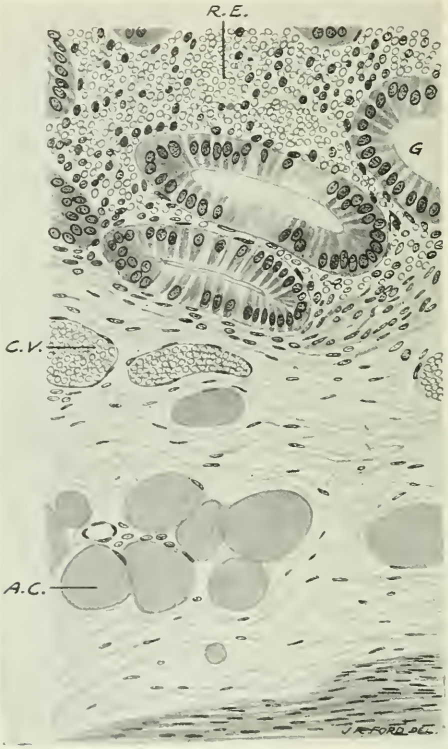

FIG. 3.

A section through mucosa and submucosa of large intestine (colon). *G.*, gland of large intestine; *A.C.*, adipose cells; *C.V.*, congested vessels; *R.E.*, red cells extravasated into mucous coat.

Colon: There was extreme congestion, with everywhere hæmorrhages into the mucous membrane. Cellular infiltration was less marked than in the small intestine (fig. 3).

Liver: Extreme changes were present. There was almost universal fatty degeneration of liver cells. At the periphery of the lobules fatty changes were complete, and nuclear staining was often absent. Round the portal vein fat globules were present, but degeneration was less extreme, although nuclear staining was definitely impaired (fig. 4).

There did not appear to be any marked change in the perilobular zones supplied by hepatic vessels.

Pancreas: There was marked increase in the interlobular fibrous tissue, particularly that surrounding the ducts. In certain ducts appearances suggested desquamation of lining epithelium. There was some congestion of blood-vessels, and the blood in the veins showed polymorphonuclear leucocytosis. The gland tissue appeared natural, but the capillaries were congested and red cells—lying free amongst the gland cells—were seen. In sections stained by Van Gieson's method early interlobular fibrosis was present.

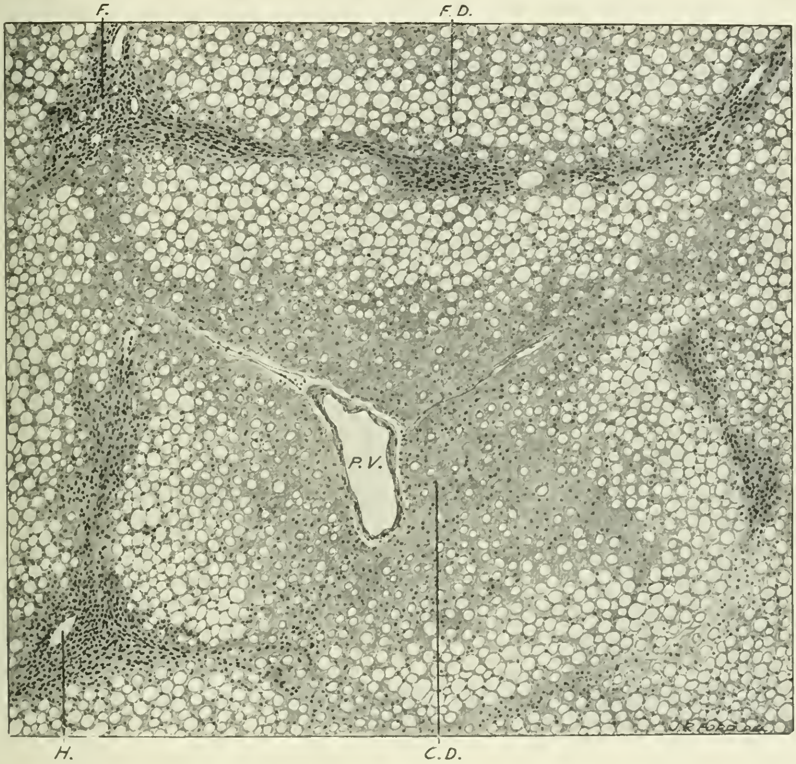

FIG. 4.

A section through an area of the liver. *C.D.*, degeneration of cytoplasm extending to the portal vein; *P.V.*, portal vein; *F.D.*, liver cells near hepatic vessels showing extreme fatty change; *F.*, increased fibrous tissue and proliferation of connective tissue; *H.*, hepatic vessel.

Mesenteric gland: No definite changes were found.

Suprarenal: No changes were found.

Spleen: This was engorged. There was some slight thickening of the capsule, with very marked increase in perivascular fibrous tissue and marked increase in extent of lymphoid (Malpighian) follicles.

Kidney: Showed congestion, with some cloudy swelling.

Bacteriological Investigations.—The mucous membrane was scraped off two or three different parts of the large intestine and smeared over three neutral red agar (Dr. Houston's "Rebipelagar") plates. Many red and colourless coliform colonies developed in twenty-four hours, and also some streptococcus colonies. The red, lactose-fermenting, coliform colonies and the streptococci were not studied further. Several of the colourless colonies on the "Rebipelagar" plates were studied in detail, and the organism proved to be a variant of the *Bacillus dysenteriæ* (Flexner).

Isolation of Bacillus dysenteriæ (Type Flexner, modified) from the Intestine Post mortem.—It was a longish, coliform, Gram-negative bacillus; non-mobile, but exhibiting slight Brownian movement in young broth cultures. On agar the growth was like that of the coli-dysentery group of organisms and gelatine was not liquefied. In broth, after five days at 37° C., a fair amount of indol was produced and tested for with the paradimethyl amido-benzaldehyde reagent. In milk the organism grew well; the reaction was slightly acid on the first day, neutral on the third day, and markedly alkaline on the fifteenth day. The fermentation reactions were as follows: On the first day, acid and no gas in glucose, mannite, galactose, maltose, salicin, and isodulcite. On the fourth day some acid and no gas in sorbite and glycerine, and slight acid in dextrin (four to seven days). No acid or gas was produced in lactose, saccharose, inulin, raffinose, or adonite in seven days. The agglutination of this bacillus was tested with a *Bacillus dysenteriæ* (Y)-agglutinating serum. At the time of use this serum had been prepared nearly two years, and its agglutinating titre was considerably lower than it had been. It agglutinated the Flexner bacillus completely in a 250-fold dilution; partially at 1 in 500 and slightly at 1 in 2,000. The bacillus isolated from this case was agglutinated, partially at 1 in 250 and slightly at 1 in 500 up to 1 in 2,000. There can be no doubt, therefore, that we are dealing here with a dysentery bacillus of the Flexner group differing from the type bacillus in only a few minor points. On referring to Morgan's paper in the *Journal of Hygiene* for March, 1911, it will be seen that Flexner's bacillus produces no acid in sorbite, salicin, isodulcite, or glycerine; whereas the organisms isolated from this case produce some acidity in all these media in two, four, or, as in the case of glycerine, in seven days. Cultures made from the liver, spleen, and mesenteric glands remain sterile. From the heart blood *Bacillus coli* and streptococci were grown—to be regarded as a terminal or post-mortem infection.

This case is an extremely interesting one, because clinically it was regarded as one of colitis with recurring acute attacks, without its dysenteric nature having been established. Post mortem the condition of the large bowel closely resembled that of patients in asylums who have suffered from subacute or "periodic" dysentery. Outside asylums dysentery is usually stated to be rare in this country. In cases of summer diarrhœa American observers have found the dysentery bacillus, but Morgan, who made a careful study of the disease in this country, failed to find the dysentery bacillus in the stools. To show that infection with this bacillus is not so rare as is commonly supposed, we may mention that within four months of isolating the *Bacillus dysenteriæ* from the above case, similar organisms were isolated by one of us from two other children who came from widely separated parts of the country.

Our other cases were none of them fatal, and they will only be used to illustrate important points of likeness or features of special interest.

Case II.—This was a boy who was seen by one of us in consultation on several occasions. In some respects we think that this was a unique case, for an accurate daily record was made of the diet from May 27, 1909, to June 12, 1912, that is, a period of over three years. The weight was also kept from birth, and so we are able to give a graphic representation of the beginnings of infantilism in the form of a chart which we think is a very interesting one (fig. 5). The records of this case also provide us with some concrete examples illustrating the extreme difficulties that arise in dieting such cases. This child was born in November, 1907, and was breast-fed for five months, and after this took cow's milk well until January, 1909, at the age of 13 months, when he had "gastritis." In April, 1909, he had whooping-cough, and this was followed in May by diarrhœa, which was ascribed in part to dentition. The motions contained mucus, were porridgy in consistence and colour, and singularly odourless. From this attack he made a slow but steady recovery. In August, 1909, during some hot weather, a nurse gave him some unwholesome raw meat juice, and a chronic diarrhœa developed which aroused no particular alarm until October 2, when nearly 2 years old. Then he collapsed suddenly, and was apparently dying. The child, however, rallied from the collapse, but for the next three years there was a continual struggle carried on with the assistance of the most skilful trained nurses that could be obtained. At birth he weighed $8\frac{1}{2}$ lb., at 1 year $24\frac{1}{2}$ lb.; at 2 years his weight was 17 lb.; at 3 years $17\frac{1}{4}$ lb., and at 4 years $25\frac{1}{2}$ lb. Among the most striking symptoms were intervals of extreme distension, general anasarca with fluid in the peritoneal cavity, attacks of heart failure and diarrhœa or constipation, with the passing of pale stools and mucus. At the present time he is, with the aid of supports, just learning to walk, and the photograph, taken when he was aged 4, shows that he looked like making a recovery which, at the age of 5½, seems more assured.

The one fact that stood out prominently in the management of the case was the one that has struck us and others, that progress in diet had to be infinitely slow. It may be safely stated that this boy, most skilfully nursed and seen by many medical men, had practically every resource of invalid diet tried. In addition to this his father was a man of extraordinary accuracy and pertinacity and noted every detail which had bearing upon the success or otherwise of any experiment in this direction. Yet when the boy had been gaining steadily and was 5 years 3 months old this was a specimen of the diet that had been found safe and effectual in the twenty-four hours: Milk, 35 oz.; Virol, 5 dr.; cream, ½ oz.; the juice of twelve grapes; water, 6 oz.; a slice of chicken, six buttered rusks, some cauliflower and orange jelly.

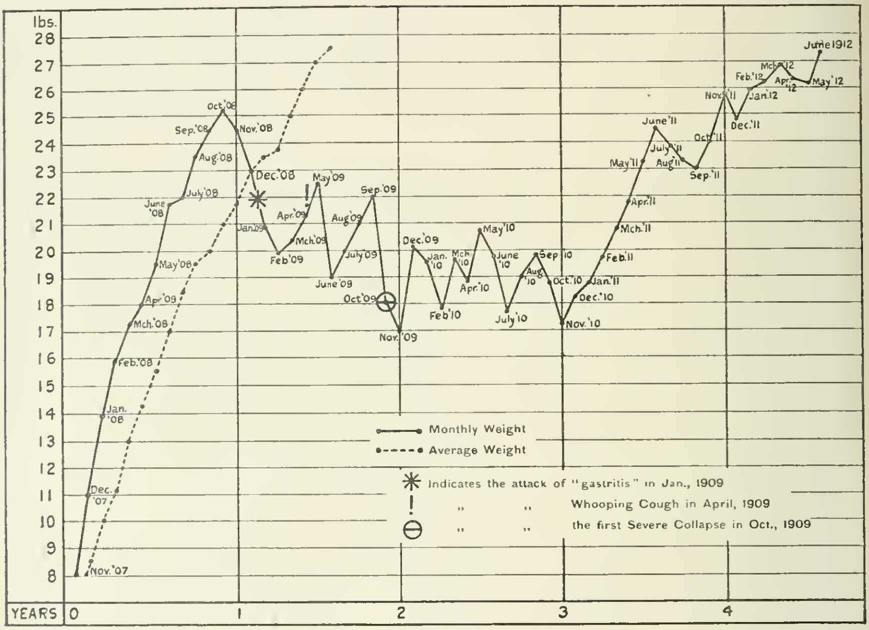

Fig. 5. (Case II.)

A chart of the weight from birth in November, 1907, to June, 1912. The horizontal line, 0, 1, 2, 3, 4, represents the years. The vertical line represents the weight in pounds from 8 to 28. The dotted line represents the increase in weight of an average child. The black line is subdivided by dots representing the successive months. This chart illustrates the development of the "infantilism" coincident with the inability to absorb sufficient nourishment.

In September, 1909, before his first and almost fatal collapse and when the nature of the condition had been hardly realized, these experiments with diet are of interest. Benger's food was given for five days, during which there were twenty-three motions and three vomits, while, on the other hand, small quantities of Savory and Moore's food always suited the patient and was at one time one of the only means of giving nourishment. Cream was tried for four days and on three of them produced sickness. Potato produced green motions and sickness. Chicken caused foul motions and sickness. Eggs, scrambled or lightly boiled, made the child extremely ill with vomiting and diarrhœa. After the first collapse this diet illustrates one which was well borne and produced a slight but steady increase in weight: 21 oz. of cow's milk and 3 oz. of barley water; 7 oz. of Savory and Moore's food, $\frac{1}{2}$ oz. orange juice and 2 dr. of meat juice, with 2 dr. of brandy; the amount of fluid was about 33 oz.

The following is an example of the results of hurrying the progress of the diet. The preceding diet had, as we have stated, enabled the child to rally, and after losing $3\frac{1}{4}$ lb. in the attack he had gained 11 oz. back in a fortnight. The next week he remained stationary, and the dangers of the case not being brought home, a determined attempt was made to press on recovery. Four teaspoonfuls of pounded sole were followed three hours later by a paroxysm of abdominal pain with some collapse. Then Savory and Moore's food was increased in a week from 7 to 27 oz. in the twenty-four hours. As a result, to the delight of all, the child increased $1\frac{1}{2}$ lb. in weight, but then followed dangerous collapse with great abdominal distension which proved almost fatal on November 22, 1909. By the following January the weight had dropped to its lowest (16 lb. 6 oz.) before once more the child commenced to make any steady forward step upon an almost starvation diet.

Case III.—This case is a very characteristic example of the condition we are considering, which illustrates the steady tendency to improvement which occurs without any clear reason. Male, aged 5, was fed upon Ridge's food for seven months and weighed 16 lb. 2 oz., and at that age attracted much attention at a baby show. Later, however, rickets developed. When 2 years 10 months old both he and his sister had an attack of summer diarrhœa with green motions, for which in the fifth week he was admitted to the hospital and remained in twelve days. The chief emphasis there was laid upon the rickets. A return of diarrhœa occurred in the following summer and he was readmitted with the provisional diagnosis of abdominal tuberculosis. He was then passing large motions, and while in hospital, from June 8 to July 22, 1912, he lost $1\frac{1}{4}$ lb. in weight. He was pale and soft, the belly protuberant and tympanitic; the liver was felt below the costal arch; von Pirquet's reaction was negative. Since that date the mother, who has been most attentive to the child, has had one continual struggle with his diet. Large white offensive motions were usually passed, and the least error produced diarrhœa, when the white colour of the motions became less evident. During the last twelve months there has been a slow gain, which was interrupted once by an interesting episode. The boy's father, naturally irritated by the slow gain on the apparently starvation diet, in a moment of mental exaltation defied his wife and gave the child some pork gravy and potato. The result was a prolonged attack of diarrhœa with the usual fall in weight. This child shows the infantilism, the pallor, the desire for drinking much water, the softness of tissues and tendency to tympanites. He has been at times very ill. Now he is slowly gaining ground and the motions are becoming coloured. It may be added that bismuth has been very helpful in the minor attacks. His weight at the time he attracted attention at the baby show when aged 7 months was 16 lb. 2 oz; now at the age of 5 years it is 29½ lb. The course of events in this case was: (1) Rickets; (2) acute summer diarrhœa; (3) recurrent diarrhœa; (4) the appearance of cœliac symptoms; (5) gradual convalescence, with infantilism resulting from the previous illness.

Case IV.—Male, aged 1 year 7 months, was under observation for eight weeks and was brought to hospital for an attack of diarrhœa of a fortnight's duration. When aged 10 months this patient had an attack of acute diarrhœa of the epidemic summer type and from this he never fully recovered. He was breast-fed only during the first three months of life and then given successively cow's milk, Nestlé's milk, barley water, and Virol, without success. His weight at birth was 6½ lb. He was described as of marasmic appearance, expression somewhat anxious, rather ill-nourished. He was typically pot-bellied, the liver could not be palpated, but a dilated and thickened colon was easily felt. There was no mass or any free fluid in the abdomen. The stools were characteristic, bulky, semi-solid, clay-coloured or almost white, offensive and not infrequently possessing a marked cheese-like odour. Von Pirquet's tuberculin reaction was negative. No special attempt at dieting was made and he left hospital but little the better. His weight on leaving hospital was unchanged, 14½ lb.

Case V.—Male, aged 1 year 8 months. This boy was under observation from January to March, 1913, with "wasting" and "rickets." There had been diarrhœa at intervals since birth; the bowels opening three times a day, stools large, putty-coloured and offensive; at times there was mucus in stools. Frequent vomiting occurred some hours after food. Two months before admission to the hospital patient had an attack of bronchitis, after which he was noticed to drag his right leg and had not been allowed to walk since that time. He had measles and pertussis when 6 months old and has always been delicate. He was quite unable to take cow's milk, though formerly fed on milk and water, but since January 18 he had tolerated Glaxo. On January 28 patient had an attack of laryngismus stridulus. When admitted to hospital on March 3 he was fairly well developed but there was definite evidence of rickets in the long bones and ribs. The abdomen was prominent, soft, but not tender, and the liver could be palpated. There was impairment on percussion in the flanks and lower abdomen pointing to the presence of free fluid. Whilst in hospital he was rather constipated, only twenty-two stools being passed in twenty-one days. The stools were always pale, bulky, greasy, and sour-smelling, they were never watery and contained neither mucus nor blood. His weight on leaving hospital was, as on admission, 1 st. 5 lb.

Case VI.—Male, aged 4 years 10 months. He was admitted to hospital in February, 1913, with the history that he had suffered frequently from attacks of severe diarrhœa ever since birth, his stools containing sometimes mucus and undigested food. He had been subject to attacks of abdominal pain, which were associated with marked swelling of the abdomen and vomiting, and was described as always thirsty. He had never attempted to walk. He had pertussis when aged 3½, and as an infant was bottle-fed. He was described as a remarkably undersized boy with marked signs of rickets. The skin of his face and head was rough and dry, his teeth extremely defective and carious. His abdomen was prominent but not tender on palpation ; the liver extended 1½ in. below the costal margin. The stools were dark in colour, slimy, with mucus, and semi-formed. He was given a diet of milk and cereals and the carious teeth removed. He left the hospital after a month's treatment somewhat improved, having gained in weight from 1 st. 6 lb. to 1 st. 6½ lb.

Case VII.—Female, aged 4. This patient was under treatment, with characteristic cœliac symptoms, from April 6 until July 5, 1913. She was brought to hospital for backwardness. Her mother, who was unusually intelligent, had studied the child's case carefully, and was able to describe the illness with some accuracy. She stated that since the hot summer of 1911, when the child had suffered from a severe attack of acute summer diarrhœa, her digestion had been impaired and her bowels had never acted properly. During the three days prior to admission to hospital the child's motions had been white and solid, but before this she had frequent diarrhœa—the dejecta resembling weak tea. With reference to her previous history, it was stated that the child was a healthy baby, breast-fed for fourteen months, and afterwards progressing normally up to the age of 2. Since the age of 2, however, from the attack of acute diarrhœa mentioned above, she had made no progress and had scarcely grown at all. As regards diet, it had been noted that eggs were always liable to cause immediate diarrhœa, meat foods invariably were better borne than milk or milk puddings, while the child herself preferred water rather than milk or tea to drink. She was the second child of a family of three, and both her brothers had been born with jaundice which had lasted during ten days. They are now healthy. When admitted to the ward there was nothing characteristic in the patient's appearance. Her intelligence was approximately that of her age. Her teeth were good. She was not rachitic. The abdomen was globular, full, but not greatly distended; no mass could be felt, or thickened gut, and there was no peristalsis, umbilical pouting, or hernia. The stools were bulky, pultaceous, sour-smelling, offensive, yellow or clay-coloured. When on fat-free diet they became less offensive, less copious, and much darker, but were *never formed*.

Gains weight ...	April 8, 1913 ...	Milk diet :— Stools very fatty and offensive
	April 15, 1913 ...	Fat-free diet :— Stools better, less bulky, still not formed, darker but not natural
	April 23, 1913 ...	Ordinary diet :— Stools again bulky, offensive, pale, butyric odour
Loses weight ...	May 8, 1913 ...	Special diet for three days :— Breakfast, 2 eggs and whey Dinner, broth, steak Tea, 2 eggs and whey Supper, 2 eggs and whey Stools very numerous, darker and much more loose and offensive
Gains weight ...	May 10, 1913 ...	Eggs, bacon, cream, full diet :— Stools still bulky, putty-coloured, loose

Stools on admission resembled an inferior grade of putty, but were rather granular than pasty, the odour was sharp and perhaps butyric, usually one *per diem*.

A bacteriological examination of a stool was made and the following organisms found: Many Gram-negative bacilli, many Gram-positive bacilli, a few Gram-positive streptococci; no dysentery bacilli could be isolated from the fæces.

Under hospital treatment the child's weight gradually rose from 25 lb. to 28½ lb. It was noteworthy that she was happier and more alert when on a fat-free diet, that her colour improved, and that the number of stools *per diem* was much less than on a full diet containing an average quantity of fats. The special diet containing eggs was very ill tolerated and gave rise to a rather offensive and frequent diarrhœa.

Case VIII.—Female. This case is of very great interest. She is now aged 9 and has been an inmate of the hospital from time to time since she was 18 months old. She was brought to hospital for an attack of diarrhœa and sickness, with bronchitis, of a week's duration. Although healthy at birth and making fair progress during the first year of life on a diet of cow's milk and barley water, during the latter six months her mother had been dissatisfied with her progress and had during two months prior to admission attended the out-patient department of the hospital. An attempt to add bread and butter to the milk diet had been entirely unsuccessful. On admission she already presented the changes of rickets. The thorax was laterally compressed with prominent sternum and marked beading of the ribs. Harrison's sulcus was well defined. The anterior fontanelle was unduly large for the age of the child, the epiphyses of the long bones everywhere enlarged. The abdomen was full, some tympanites present and both liver and spleen enlarged. No teeth were present. The stools on admission were frequent, very offensive, green and slimy, but contained no blood. Although the symptoms speedily improved and with cessation of vomiting the stools began to assume a normal character, fourteen days after admission the child developed well-marked tetany. Facial irritability, carpopedal spasm and "obstetrician's" hand, were all marked and Trousseau's sign was also present, and there was definite œdema of the dorsum of hands and feet. Laryngismus stridulus did not occur, The condition gradually passed off and in the course of a fortnight had completely disappeared. Her weight was 13¾ lb. Nothing was seen of the child until two years later, when at the age of 3½ she was again brought to hospital. Six months earlier she had had an attack of measles and with it diarrhœa. She improved for a time but relapsed a month before coming to hospital, and during the last week was wasting and becoming rapidly worse. As many as twelve motions had been passed in the day, the stools being usually white, sometimes green. It was noted that the child appeared fairly well developed and moderately well nourished, that evidence of rickets was present, but there was no impairment of movement of the limbs. Her teeth were good. She speedily improved and on leaving hospital weighed 1 st. 6 lb. 8 oz.

Four years afterwards she was again brought to the hospital for swollen abdomen and looseness of the bowels. Her condition was at this time frankly diagnosed as *morbus cœliacus*. The stools were pale, putty-like, soft and moulded, and contained no visible bile, nor did the administration of ox-bile in capsules give rise to any change in their character. After ineffectual treatment during six weeks the patient was put on a fat-free diet on May 8, 1911. On May 16 the motions, though still rather bulky and unformed, were of normal brown colour. On May 23 the motions were formed, the child out of bed and doing well. She was now again put on an ordinary diet containing fats on June 1 and the stools reverted to their former type, and on June 6 she was losing weight and was forced to return to bed. On June 13, though well enough to get up, she was still losing weight and was taking her food badly. On leaving hospital her weight was 2 st. 10 lb. Whilst in hospital she had no diarrhœa, the number of stools averaging one *per diem*.

A year later the patient was again admitted for an attack of pain in the knees. Seven weeks before admission the knees became swollen and painful and the patient went off her legs. External splints were applied for the treatment of the genu valgum which was present, but the pain was aggravated by these and unrelieved by massage and they were accordingly removed and the child put to bed. She was found to be bright and intelligent. The knees were bent and could not be extended, although easily and fully flexed; there was some peri-articular thickening both of knees and ankles, with limitation of movement at the ankle also. A radiogram of the knees showed increased translucency of the epiphyses and some irregularity of structure, a condition that is occasionally associated in adults with alimentary toxæmia or infection. Her stools showed the same characteristics as formerly. Several carious teeth belonging to the milk dentition were removed and the pain in the knees and swelling gradually subsided, but the patient could not be induced to walk. Six months later she developed, without obvious cause, an attack of tetany with facial irritability and carpopedal contraction.

She was last seen in July, 1913, and could then walk with difficulty.

Case IX.—Male, aged 11 years 5 months. He first came under observation when aged 5 years 8 months, in April, 1907. He was quite healthy until 1905, when he began to have diarrhœa. The motions were pale yellow in colour, sometimes resembling dirty water and always foul-smelling. Wasting had become marked and the abdomen was constantly swollen. When admitted to hospital he appeared fairly well nourished and of healthy complexion. The abdomen was distended and flabby, easy to palpate and not tender. No peristalsis was seen. The stools were formed but pale, and frequently passed in bed owing to a degree of incontinence. Diarrhœa recurred in December, 1907, with very marked distension of the colon, and again in 1913. At this time the abdomen was greatly distended and visible peristalsis of the colon present. The stools were absolutely colourless, one *per diem.* There was no trace of jaundice, and microscopical examination of the stool showed the presence of fatty acids, fats, and soap. The stool was exceedingly frothy owing to the presence of gas bubbles throughout. In April, 1907, the child's weight was 1 st. 12 lb. 8 oz., and had increased by May to 2 st. 1 lb. 14 oz. On January 14, 1908, 2 st. 5 lb. 8 oz. In March, 1913, the weight was 3 st. 7 lb.

This concludes the clinical cases that we have brought forward, although there are several more under our observation of the same character, which would only repeat the story. We wish now to emphasize once more that we have endeavoured to describe a group of cases of recurrent diarrhœa in childhood, which frequently seems to date its first onset from an attack of acute diarrhœa that, clinically, may resemble the acute enteritis so often met with in the summer. Later, however, those characters have arisen which our examples have illustrated. To everyone it will occur that we are again describing a condition well recognized since the writings of Dr. Gee as that of cœliac disease, and this is the first point upon which we wish to dwell. To us it has seemed that "the cœliac disease," using the term in its usual sense, may very possibly be a phenomenon which, for the want of a better term, we would say is grafted upon the original illness. When some of these cases of ours were seen in the early stage they did not show the well-known characteristics, and several of them during the course of their long illnesses have passed green or blood-stained or brown fluid motions. Others again, we admit, had from the first or nearly so passed motions of the character described in the cœliac affections, and there are others that do so from beginning to end of the illnesses. Our point is this, does the cœliac affection represent a disease in itself, or is it the expression of some peculiar intestinal or other fault which may complicate various abdominal affections, or be the result of some particular lesion that may arise in connexion with various abdominal affections? Or is it in part a result of an unsuitable diet in a disease which itself still persists although these special symptoms may disappear when the diet is corrected? Or again, is it —following the line of thought suggested by Herter—the result of some peculiar bacterial flora acting upon disordered alimentary contents? There have been important writings upon cœliac disease which have approached the problem of its nature from different standpoints. Thus Dr. Gee in bold outline sketched the salient features. Dr. Gibbons laid stress on the widespread derangement of function of the intestinal glands. Dr. Cheadle, impressed by the lack of colour and excess of fat in the stools, the abruptness of onset in some of the cases, together with the absence of jaundice, laid much stress upon the impaired function of the liver. Dr. Herter turned to the bacteriological problem, and insisted upon the preponderance of a Gram-positive intestinal flora, which he associated peculiarly with the condition. Dr. Hutchison has emphasized the important bearing of diet.

We have been led to the same problem from yet another path by the study of this group of cases of recurrent diarrhœa in which we find ourselves coming upon phases in which we are unable to escape from the conclusion that we have arrived at the same goal as the writers we have mentioned.

The chief importance of our contribution appears to us to lie in the results of the examination of the fatal case. The extensive lesions that were found are from every point of view of interest. We naturally ask ourselves whether, following our own line of thought, it is possible to find in them two distinct processes? Can we see some lesions which are the evidences of the recurrent and persistent diarrhœa, and others which bring about the cœliac symptoms? Are, for example, the chronic intestinal lesions the result of some particular infection—that of the bacillus of dysentery for example (we must not, however, with the evidence at our disposal do more than make the suggestion to illustrate our point)? On the other hand, are the changes in the liver a partial explanation of the cœliac symptoms? It is difficult, we imagine, to state how rapidly the extreme damage to the liver occurred in our fatal case, and quite possible that such changes are only evidence of a secondary toxæmia. On the other hand, we would point out that enlargement of the liver was repeatedly noticed in this case long before death, although it became more evident at the end. It does not, then, seem impossible that without necessarily any notable enlargement, there may be in these cases some peculiar poison damaging the hepatic function in some special way, but not causing any jaundice. Although acholia is now known to be a term that is too committal, may not the condition of the liver, nevertheless, take a decided part in producing the cœliac symptoms?

The condition of the pancreas was, we must admit, somewhat a surprise. We had thought to have seen more extensive disease, but that there was some interlobular pancreatitis is a fact which is worth mentioning. It would be a mistake to lay overmuch stress upon a single record such as this one, but there is clear evidence in the histories of the recorded cases that peculiar poisons are present in these illnesses, producing such symptoms as tetany, anasarca, neuritic pains and arthritic changes. They are sufficient, we feel, to make it justifiable to suggest that we have two factors to consider—the possible occurrence of a peculiar infection, and the appearance of special symptoms of the cœliac affection as a sequel but not necessarily as a constant occurrence.

The standpoint we have taken has led us to adopt the title to our contribution that we have done, because we wish to ascertain whether the general opinion is that we are yet in a position to consider the cœliac affection as in itself a disease. If there is unanimity upon this, then we think the original term "cœliac disease" the safest as being the least committal. Later researches have shown that the colour of stercobilin may be masked by fat and bile but is not necessarily absent from the white fæces, and on this account acholia pledges us too far, although, as we have mentioned, this term directs attention to the possible influence of disordered hepatic function.

Malabsorption is clearly a predominant feature in these illnesses, and we need not delay over the infantilism, or extreme weakness of the lower extremities or flatulent distension, and general flabbiness, and anæmia, for we think this is a sufficient explanation. It is an interesting point that a considerable number of cases after reaching the age of 5 to 7 seem in a mysterious way to outgrow the tendency to recurrent attacks, and to gain step by step a tolerance to a more generous diet, and one wonders in such cases to what extent the bowels remain permanently damaged, and whether the liver or pancreas or both acquire in some way a greater vitality, and thus aid in overcoming the cœliac element.

The problem of the *diet* seems to us a very difficult one, for a study of our cases and of others we have not recorded seems to point to any of the chief articles of diet as being at one time or another harmful, although we think Herter inclines to the carbohydrates as the first offenders. Fats seem to us to stand first as the most difficult, yet some cases may take cream. Carbohydrates may be tolerated better than any foods at times when the condition is almost desperate, but often they are ill borne, and if pressed appear to assist in causing a distension in which the entire bowel is implicated. Broths and meat juices are, perhaps, as likely to be dealt with successsfully as any food, but with milk the most diverse results occur. In some cases milk seems most injurious, in others it has been the great stand-by. The dried milks have often been of service. Eggs are frequently disastrous, and again fish has been most unsatisfactory, and minced meat equally so. The malted foods are very likely to produce diarrhœa. The widespread intestinal lesions prepare us to find that all forms of food may be difficult to assimilate. Our experience, in fact, has been that in some cases a diet has been arrived at by bitter experience with the particular individual, and has been evolved quite empirically. We would add that diarrhœa is by no means an invariable symptom, for there may be also constipation, which may prove equally dangerous from consequent meteorism. Of all drugs the one that seems to us after a prolonged experience to be the most generally successful is bismuth. We have had the most convincing proof of this in the fact that several mothers of much intelligence and unsparing in care of their children have come back asking for this when a relapse was threatening. We do not pretend that it will cope with the worst cases, but it is, we believe, of the greatest value in the milder ones, although it is powerless to combat an unsuitable diet. Opium and grey powder have, as is well recognized, their times of value. And when the stage of convalescence is well established mild iron preparations are useful. The routine use of cod-liver oil and malt in the stages of remission may in our opinion precipitate an attack.

The remarkable tendency to great abdominal distension and the diagnosis in some of these cases of *dilated colon* raises the interesting question as to whether a condition allied to Hirschsprung's disease, or indeed whether some cases actually described as of this nature, are not to be ascribed to this peculiarly severe and chronic affection damaging the neuro-muscular elements of the bowel. The course of events we would picture then, is that the active disease has quieted down, leaving a much weakened gut, and constipation has resulted. This constipation has been neglected or permitted at first as a lesser evil, and thus added to the strain upon the weakened bowel, with the result that an extreme degree of atony of some of the most affected part has resulted. The following history is a suggestive one in this connexion :—

L. W., a boy, aged 6 years 4 months, had always been inclined to be constipated, but when 3½ years old had a prolonged attack of diarrhœa, passing slime and blood, after which the constipation became much more severe. Now the bowels are frequently not moved for a week, and even for three weeks or nearly a month. When constipated the abdomen gets very distended. The transverse colon is clearly enlarged and the upper segment of the abdomen has the appearance of fullness, which is not uncommon in Hirschsprung's affection. The report upon the bismuth meal confidently stated that the condition was characteristic of Hirschsprung's affection. Under persistent treatment large, hard masses of fæces are being passed, but it is too early to say what permanent improvement is going to result.

The *diagnosis* from abdominal tuberculosis is not easy, and it is one of the valuable results of the examination of the fatal case that it proved conclusively that a condition at first considered more than once to be of a tubercular nature was undoubtedly non-tubercular. This particular point strikes us that the rapidity with which in this affection extreme illness is reached and the possibility of recovery from such an extreme condition on more than one occasion makes a clinical picture unlike that of abdominal tuberculosis. The absence of tubercular masses in the abdomen is also another fact of importance. The occurrence in a few cases of general anasarca is very remarkable. The fatal case also warns us against becoming stereotyped in our use of such terms in childhood as gastritis, gastro-enteritis and colitis, for there was evidence here of an affection of the entire alimentary tract beyond the œsophagus.

Lastly, with regard to the bacteriology, it is clear that at present the results have been too diverse for us to see our way at all plainly, although the accurate investigations recorded here are suggestive. To us the peculiar recurrent alimentary disturbance suggests an infective origin, but the acholia may very possibly be the result of non-bacterial processes grafted upon the bacterial infection. The valuable investigations of Herter upon this point are of much interest, but at present we incline to the view that the cœliac element has not in our cases to be looked upon as the essential element in the illnesses, and we should state as further evidence in support of this that cœliac symptoms may develop abruptly in the course of a night after a sudden chill (a point commented upon by the late Dr. Cheadle), without evidence at any time of such a form of diarrhœa as was met with in the cases related here.

Finally, we would emphasize that this contribution has been brought forward with the desire to learn both from the clinical and pathological side any facts that may assist us to deal with these exceedingly difficult cases more satisfactorily and understand their interpretation more clearly.

APPENDIX.—DIET.

A specimen of a—

	Full diet for a child aged 3 with morbus cœliacus, upon which a gain of weight was obtained in hospital	Fat-free diet
Breakfast at 5 a.m. ...	Bread, 2 oz. ...	Bread and jam, 2 oz.
	Butter, 3 dr. ...	Weak tea with two lumps of sugar, 7 oz.
	Fat bacon, $\frac{1}{2}$ oz.	
	Milk, 7 oz.	
Lunch at 9 a.m. ...	Bread, 1 oz. ...	Biscuits with jam, 2 oz.
	Butter, 3 dr.	
	Milk, 5 oz. ...	Lemonade, 7 oz.
Dinner at 12 noon ...	Mince, 4 oz. ...	Fish or mince with potato, 6 oz.
	Pudding, 4 oz.	
	Milk, 5 oz. ...	Bread and jam, 2 oz.
Tea at 3.30 p.m. ...	Bread, 2 oz. ...	Bread and jam, 2 oz.
	Butter, 3 dr. ...	Weak tea, 7 oz.
	Milk, 7 oz.	
Supper at 6 p.m. ...	Bread, 1 oz. ...	Bread and jam, 2 oz.
	Butter, 3 dr. ...	Lemonade, 7 oz.
	Milk, 5 oz.	

One drink of milk at night of 7 oz.

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Medical Section.

November 25, 1913.

Dr. Samuel West, President of the Section, in the Chair.

Two Cases of Non-cancerous Tumour of the Stomach.

By A. M. Gossage, M.D., and J. Braxton Hicks, M.D.

Benign tumours of the stomach, except adenomatous polypi, are rare; they include lipomata, myomata and fibromata, and various mixed forms. Even sarcomata are uncommon compared with carcinomata. Of the larger tumours, myomata are the most frequently found, and Deaver and Ashhurst state that up to 1909 forty-nine cases had been recorded. In some of these there was naturally in addition to unstriped muscle a good deal of fibrous tissue. Pure fibromata, except as small polypi, seem almost unknown; our cases both show admixture with other elements and the similar case described to the Surgical Section by our colleague Mr. Spencer [10] also contained sarcomatous cells. Bircher [1] successfully removed a large subserous fibrous tumour, which proved to be partly sarcomatous, and Deaver and Ashhurst [2], and Fenwick [3], figure small subserous fibromata in their books. Fischer [4] removed a fibro-lipoma from the anterior wall of the stomach of a woman, aged 37. Spencer's case, like ours, was submucous, and projected into the cavity of the stomach which it nearly filled. He mentions the occurrence of a fibroma in the œsophagus, and points out that there are some specimens of submucous fibromata from the stomachs of fishes in the Museum of the Royal College of Surgeons. Tumours more frankly sarcomatous than ours, with so much fibrous tissue as to be labelled fibro-sarcomata, are rather more frequently met with.

Hæmatemesis has not been a common symptom of these gastric tumours, though fatal hæmorrhage, such as occurred in both our cases, has been recorded with myomata projecting into the cavity of the viscus by Kemke [6], Miodowski [7] and Niemeyer [8], and slighter degrees of hæmorrhage are somewhat more common in adenomatous polypi than in myomata. These tumours may give rise to no symptoms; being merely accidentally discovered as a lump in the abdomen in a routine examination of the patient or first found in the post-mortem room. Naturally symptoms are more likely to be complained of with growths that project into the cavity of the organ than where the direction of growth is towards the peritoneum, and in such cases gastric discomfort or even pain, which may be of a dragging or tearing character, and vomiting have occurred. Vomiting is said to take place at irregular times and is hardly ever a prominent symptom. Where the growth is near the pylorus intermittent obstruction of the canal may be caused, and in consequence marked dilatation of the stomach [5] [9]. In one of our cases no symptoms were complained of until the onset of the fatal hæmorrhage, while in the other, although in position, size and termination almost exactly corresponding to the first, there had been for a considerable time complaint of abdominal pain. Spencer's case had had both pain and vomiting, which were probably referable to the gastric tumour. In both our cases the tumour could have been easily removed by the surgeon, while in Spencer's case a successful operation was performed. Unfortunately in each of our patients the general condition at the time of admission into the hospital precluded any surgical measures, and in neither case was a correct diagnosis arrived at until the post-mortem examination.

The details of the cases are as follows:—

Case I.—A. L., a married woman, aged 50, had been sent into the Westminster Hospital under Mr. Spencer in April, 1913, as a case of gastric ulcer. As she was too ill for operation she was transferred to the medical wards. She had been healthy up to eleven days before admission and had never suffered from indigestion. She was then attacked suddenly with collapse and several attacks of profuse hæmatemesis followed by melæna. On admission she was very collapsed and she was given a continuous injection of saline by the rectum. The temperature was 99·4° F., and the pulse 128 and very small. The abdomen moved well and there was no tenderness, pain, or rigidity, and no tumour could be felt. The pallor was extreme and a blood examination showed the following result: Serum to corpuscles, 6 to 1; hæmoglobin, 20 per cent.; red blood cells, 1,560,000; colour index, 0·6; white blood cells, 24,200; polymorphonuclears, 82 per cent.; mononuclears, 17 per cent. (large 2, small 15); transitionals, 1 per cent.

Some nucleated red blood cells present. The patient never rallied, and died three days after admission.

Post-mortem: Body of well-nourished woman. Two inches from the pyloric ring, a little anterior to the greater curvature of the stomach, was a sessile spherical tumour the size of a golf ball. On the summit of the convex surface was a small depression, brownish-black in colour. The intestines contained blood and all the viscera were very pallid. The tumour was encapsuled and fairly firm on section. Histologically it consisted of an admixture of fibrous tissue and unstriped muscle elements, and should be classed as a fibro-leio-myoma.

Case II.—H. N., a man, aged 37, had a fall on June 22, 1911, and after that suffered with slight abdominal pain and indigestion. Seventeen days before admission into the hospital he had severe pain in the back and then abdominal pain and dizziness. Blood was noticed in the motions on the following day and on the third day he vomited blood. During the next week he became delirious. He was admitted on November 30, 1911, under Dr. Hebb, to whom we are indebted for permission to publish the case. On admission he was pale, unconscious, and did not revive after subcutaneous saline. The liver was slightly enlarged, but no abdominal tumour could be felt. He died on December 4. Blood count: December 1—Serum to corpuscles, 5 to 1; hæmoglobin, 25 per cent.; red blood cells, 1,240,000; colour index, 0·6; white blood cells, 39,000; polymorphonuclears, ·72 per cent.; mononuclears, 28 per cent. (small 11, medium 16, large 1); nucleated reds, a good few. December 2—Serum to corpuscles, 5 to 1; hæmoglobin, 25 per cent.; red blood cells, 1,590,000; colour index, 0·8; white blood cells, 14,000; polymorphonuclears, 70 per cent.; mononuclears, 30 per cent. (small 18, medium 9, large 3); nucleated reds, numerous.

Post-mortem: Body well nourished, great pallor, conjunctivæ slightly yellow, all viscera extremely pallid. On opening stomach a round tumour, size of a golf ball, was found attached by a narrow pedicle, ¼ in. in diameter, to the middle of the posterior wall. On this tumour were three depressions with purple-black centres (from which hæmorrhage had probably occurred), but elsewhere the surface was bluish over the tumour and pallid over the rest of the stomach. The peritoneal coat over the base of the tumour was black, as if there was a hæmorrhage beneath. On section the growth was soft. The tumour was encapsuled and histologically consisted of a fairly coarse fibrous reticulum in which were a few unstriped muscle-fibres and numerous cells of varying shapes (spheroidal, polyhedral and small multinucleated). There was evidence of considerable degeneration and in some places there were small hæmorrhages. Histologically a fibro-sarcoma of small malignancy. The bone-marrow showed great activity.

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Recurrent Distension of the Parotid due to Calcification round a Fish Bone retained in Steno's Duct for over a Year.

By G. Newton Pitt, M.D.

S. P., aged 58, complained over a year ago that a fish bone had stuck in his throat, and although he saw a laryngologist, and a thorough examination of the tonsils and fauces was made no bone could be detected. The symptoms were not specially referred to the face, and they soon quieted down. From time to time there was discomfort over the right cheek and the parotid would at times be distended. Early in September, 1913, the gland became somewhat suddenly more distended and uncomfortable than usual, and he saw Sir Arbuthnot Lane, who thought the trouble was probably due to a calculus, although nothing could be felt in front of the masseter nor any hard mass anywhere, but on moving the cheek it seemed to pucker at the anterior edge of the masseter as though there was some adhesion due to inflammation. Mr. C. A. Clarke took an X-ray picture by placing a negative film between the teeth and the cheek, with the jaws open. A long, thin, curved shadow appeared running forwards and upwards, slightly concave downwards. It showed a very slight bifurcation anteriorly and was situated in the position of the duct about ½ in. behind the anterior edge of the masseter (fig. 1). Sir Arbuthnot Lane, with the patient under an anaesthetic, passed a probe up the duct, but was unable to reach the obstruction from inside; he therefore cut down on the gland from outside by an L-shaped incision, explored, and dissected out the duct, but was unable to find any calculus. The condition appeared to be one of atheromatous infiltration of the duct, as it could be felt between the fingers to be much thickened. Such a condition has not, however, so far as I know, ever been recorded. A small tube was passed along the duct through the mouth outside the lips and fixed there and the wound was closed. It healed up externally. The discharge from the gland consisted of saliva, but at other times there was a thick blood-stained, viscid, mucoid, purulent material, and sometimes coagulated plugs could be extruded. The swelling and tenderness of the gland varied. The tube came out on the twelfth day. Two days later the incisions broke down again at the point of juncture; saliva and blood-stained mucoid material came out. On the eighteenth day a sharp nodule projected

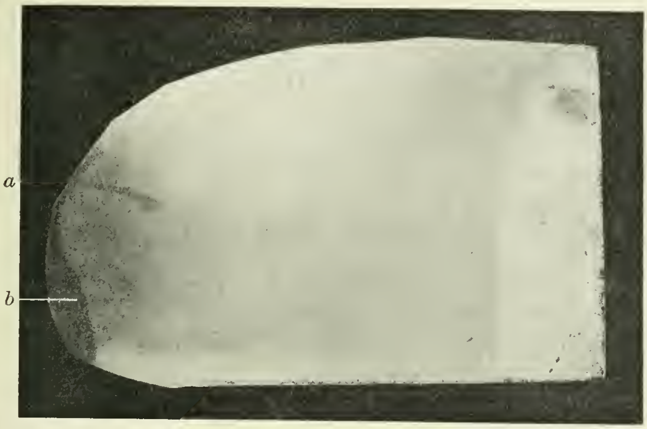

FIG. 1.

X-ray picture, lateral view of mouth, jaws wide open. *a*, shadow of foreign body; *b*, shadow of ramus of lower jaw.

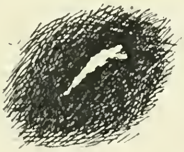

FIG. 2.

Sketch of calcified fish bone.

on the cheek, which proved to be an elongated calcareous mass, 12 mm. long, which had formed round a fish bone (possibly herring) with a very short bifurcating process anteriorly (fig. 2). This corresponded exactly with the X-ray image. The wound at once healed, but even after two months the gland sometimes distends and discharges blood-stained thick secretion from time to time into the mouth.

Blockage of the ducts of the salivary glands by foreign bodies is very infrequent, although it is said to be more common in herbivora. According to Heineke there are only between fifty and sixty recorded cases, twenty-seven having been found in Wharton's duct, nineteen in Steno's, and two in the sublingual. The bodies which have been found are straw, blades of grass or awns, fourteen times; fish bones, seven; bristles, six; ears of corn, five; feather-down, three; fruit seed, two; splinters of wood, two; piece of toothpick, one; hair, one; shot, one; piece of chestnut, one.

The usual history is that there is pain at the time when the body enters the duct. In the course of a few days or weeks this quiets down, but this is not invariably so. The gland alternately distends and empties itself at variable intervals. Often there is very little pain, especially when suppuration has not taken place. Calcification may take place round the foreign body after a time, which will lead to a more complete blockage of the duct; but in some cases, even after the lapse of a year, no phosphate of lime, which is the usual salt, has been deposited.

This is apparently the first case in which an X-ray picture of the calcareous mass has been taken, but even then we did not appreciate that there was a foreign body in the centre of the mass, although a slight bifurcation in front and the exceptionally slender and elongated shape ought to have suggested this, and moreover most calculi have been found anterior to the masseter. The short anterior bifurcated end prevented the bone from being extruded when once it was within the duct, and necessitated its gradual ascent beyond the edge of the masseter up to the gland itself.

Occasionally even after the removal of a foreign body a portion of the gland may continue to secrete saliva through a fistula and not drain well into the mouth; this is especially apt to occur when the duct has been interrupted some distance behind the edge of the masseter. Guinaud has been successful in curing such by injecting sterilized fat into the secreting tissue and destroying its function, a method which Claude Bernard employed many years ago, in order to abolish the pancreatic secretion. Where the foreign body or calculus has been anterior to the masseter its removal almost invariably leads to a complete cure.

I am able to refer to the following cases of foreign bodies in Steno's duct :—

Barnabo : W., aged 14. Swelling of parotid, which suppurated, and a piece of bone, 15 cm. by 5·2 mm., was removed by operation.

Paquet : M., aged 52. Recurrent inflammation of the parotid cured by removal of a calculus weighing 1 grm., which had formed round an ear of corn.

Scheller : Recurrent inflammation and distension of parotid due to a bristle of a tooth-brush in the duct.

Overall : When eating barbecued pig a bristle passed into Steno's duct. Two weeks later a tumour appeared, suppurated, and a salivary fistula formed. As this would not heal it was again explored without result, but on the fourth day a disintegrated bristle, folded on itself, 1 in. long, was extruded. The wound soon healed.

Wright : M., aged 38, felt a prick in his cheek when eating a chestnut ; he felt a fragment in his cheek, but it receded into the duct. Three days later the parotid swelled up and the secretion became purulent. The duct was incised without result. The gland suppurated and was opened externally. Shortly afterwards the elongated embryo of the chestnut was extruded.

Dethfelsen : Child, aged 16 months. Parotitis, due to a goose feather in the duct. When this was removed the trouble disappeared.

Brown : Left parotid distended and inflamed. A feather, 1 in. long, out of a feather bed, was found with the end projecting from the duct. The patient remembered that, when shaking a bed one day, a feather had got into her mouth.

Miller : M., aged 40, with a distended suppurating parotid. A grain of raw barley was removed after incising the duct. It was 1⅜ in. long. The beard was still intact. It had been in the duct for five months.

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As another example of the way in which the movement of an elongated body with diverging spikes projecting at one end only may be gradually propelled along a tube and be unable to return, I may refer to the case of a boy, aged 12, who in a paroxysm of whooping-cough aspirated an ear of barley grass, stem first, into his trachea. This gradually moved along the trachea and passed into his left bronchus, where it stuck, and no amount of coughing was capable of moving it. Gangrene of the lung resulted, and after a very prolonged illness of eighteen weeks the remains of the head of grass was coughed up. The original piece of grass was probably about 2½ to 3 in. long, but when coughed up it was reduced to 1¼ in., all the awns had broken off, as otherwise it could not have passed up along the trachea and been extruded (fig. 3).

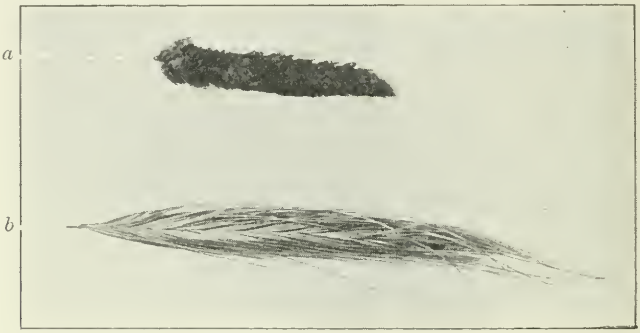


Fig. 3.

a, the remains of the barley grass which was coughed up when the awns had all disintegrated; *b*, a similar normal ear of barley grass as aspirated into bronchus.

On a Change occurring in the Pelvis in a Case of Prepuberal Atrophy of the Testicles.

By H. Batty Shaw, M.D., and R. Higham Cooper.

The patient, aged 24, came under the observation of Dr. W. Egmont Kirby for slight cough and debility. Amongst other symptoms of which he complains are obscure pains in the left abdomen associated with constipation, alternating with the passage of loose offensive stools containing "slime." He is of late years becoming irritable in temper. He is susceptible to cold weather and wears two or three undergarments of wool, and in the recent mild weather generally wears a heavy ulster. His appetite is not good; frequently he misses meals; he is troubled with flatulent distension of the stomach and has nausea occasionally.

Though frequently drowsy in the day his sleep at night is prevented by palpitation. He passes urine during the night two or three times, which is partly explained by an inordinate thirst. Other than palpitation and dyspnœa on making much muscular effort he has no cardiac symptom. His former tendency to faint has now passed off. He is sensitive about appearing in public, as his appearance, he says, attracts attention. He is tall and slightly built and, as he says, "his juvenile face and his height" seem to be the reason why people make remarks about him. As long as he can remember, his limbs, especially the legs, have been long. He says that at 7 years of age he was taken to the West London Hospital for an injury to his leg, and that it was then noticed that his testicles were misplaced, and massage and manipulation were ordered to make them reach the scrotum. At 17 years of age his testicles were present and still out of place. He was advised to press them down into the scrotum and to wear a truss to dislocate them downwards into the normal position. His general condition at this time was such as to lead his local medical man to advise a consultation. Ever since the age of 17 the organs have still further diminished in size, and now he says that the left one has disappeared and only by stretching the skin can the vestige of the right one be demonstrated. There have never been nocturnal emissions; he has no sexual desire; occasionally there used to be erections, but there have been none for a long time.

His father is alive and of good height: his mother also is alive, but is of small stature. One brother, who was 6 ft. 6 in. high, died from pulmonary tuberculosis. Another brother, who is of good height, is healthy and has two children; a sister died from an unknown cause. He had some form of dysentery when in South Africa a year ago. In early years he had erysipelas and whooping-cough and does not remember having had mumps. He was breast-fed as an infant.

He is a tall subject and stoops a little, but there is no lordosis of the lumbar spine; his height is 6 ft. 3 in. and weight 7 st. 8½ lb. His face is boyish in appearance, and he presents no signs of hair on the face. His voice is high-pitched, his head is mesaticephalic, having a breadth index of 80, the maximum length of the head (from glabella to occipital point) being 7¾ in. and the maximum breadth measured above the supramastoid ridges 6¼ in. Radiographic examination of the head shows no enlargement of the sella turcica. Although the pomum Adami can be felt it is ill-developed. The skin generally is very soft, the hair of the scalp is abundant, and fine hair is present on the forearms.

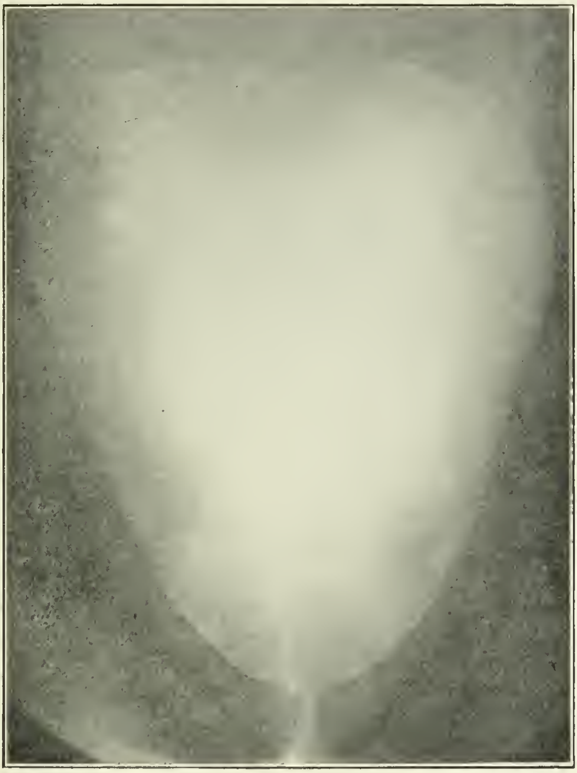
There is no axillary or pubic hair. The length of the body from the suprasternal notch to the top of the symphysis pubis is 22 in., from the top of the symphysis pubis to the ground 42 in.—the corresponding measurements of a normal man of the same age being 22 in. and 33⅜ in. respectively. He is physically active, but the musculature is slender. The development of the trunk is poor, more especially of the chest. The fingers and toes are long and tapering and the nails filbert-shaped. A photograph taken when a child shows that his fingers then were much shorter and blunter. He is very intelligent, reading hard and working at his vocation with great enthusiasm, often to the neglect of his meals. He is free from all symptoms indicating intracranial tension, and there is no alteration of the fields of vision and the fundi oculorum are normal.

The external measurements of the pelvis are given, followed by those of another normal subject of about the same age for comparison: Interspinous, 9 in. (control 9 in.); intercristal, 10¾ in. (11½ in.); external conjugate, 7 in. (7½ in.); between posterior superior spines, 4 in. (4 in.); between tuber ischii, 3¼ in. (4 in.).

The thyroid gland is defined with difficulty. In August of this year he had a cough, but the expectoration revealed no tubercle bacilli and the lungs and heart revealed no abnormality. The chest is badly shaped, and there is evidence of rickets at the costo-chondral junctions. The tongue is slightly furred, the gums somewhat spongy, and the teeth a little carious, some artificial. The urine shows no sugar or albumin. There is nothing abnormal in the abdomen.

Genital System.—In recumbency the symphysis pubis appears to be more prominent than usual. The penis is smaller than normal, and the testicles are absent from the scrotum, which also is small. On stretching the skin in the neighbourhood of the right pubic spine a small ill-defined mass can be defined which on pressure causes pain; the left testicle cannot be found at all.

The Skeletal System..—There is some tendency to stoop, due to an exaggerated curvature of the dorsal spine. This is not accompanied by lordosis; indeed, the lumbar part of the spine is inclined to share in the arc of curvature seen in the dorsal region. X-ray examination shows that the bones generally are less dense than normal, and there is delay in development. For example, the following epiphyses are not only not fused but show no sign of commencing fusion, being still separated from their diaphyses by a wide interval of cartilage in which no calcification is visible: Humerus, internal condyle, which should be completely fused between 17 and 18 years; radius (head), which should be completely fused between 18 and 20 years; lower epiphysis, which should be completely fused between 18 and 20 years; ulna, lower epiphysis, which should be completely fused between 20 and 25 years; bases of phalanges, which should be completely fused between 18 and 20 years; heads of metacarpal bones, which should be completely fused at 20 years.



From a skiagram of the pelvis, taken with plate in front, showing the abnormal shape of the pelvic brim—transverse contraction with bulging inwards in the neighbourhood of the acetabula.

The brim of the pelvis shows definite bulging inwards in the neighbourhood of the acetabula, suggesting an early stage of the triradiate pelvis. The contour of the inlet is cordiform. There is a wide separation of the pubic bones at the symphysis. The relation of the transverse to the antero-posterior diameter of the inlet of the pelvis is as 59 to 67 in the skiagram. (*See* figure.)

Beyond the general appearance of want of lime in the bones there are no other marked departures from the normal. There is, however, marked loss of density of the anterior part of the bodies of the dorsal vertebræ at the point of the greatest spinal curvature. There is no abnormality in either of the sacro-iliac synchondroses.

Comment.—The interest connected with this case, apart from the singular clinical features of the malady, is twofold. The major one involves a matter of principle and is connected with the problem of gigantism. Is the long-limbedness due directly to disturbance of the internal secretion of the testicle, or is it an indirect result and primarily dependent upon secondary changes produced in the pituitary body by the disturbed function of the testicles? In other words, Is gigantism a function of disturbance of the pituitary body only? The second question, of less but still of great importance, is, What is the cause of the unusual shape of the brim of the pelvis?

With regard to the first problem, the features connected with castration in men and the production of eunuchism are clearly defined; our case shows many of the features described. Castration of men after puberty, beyond functional disability, causes no morphological change in the individual, because, although internal secretion from the testicles is no longer possible, the influence is carried out by para- or extra-testicular tissues which after puberty are endowed with the power of performing the part previously performed by the testicle alone. If castration is carried out before puberty is established, then removal of the testicles means removal of the tissue which alone is capable of developing and maintaining the secondary sex characters. The result is that a sort of, but not a real, infantilism appears—e.g., the facial characters are infantile, but the true infantile features of a small skeleton and relatively short limbs are not developed. The vesiculæ seminales atrophy and the prostate, if already developed, retrogresses, or if not yet developed fails to develop. The penis does not usually shrink and, as in this case, is capable of being erected, hence the "haremic" rule amongst some Eastern people of amputating this organ as well as removing the testicles. The pelvis does not assume feminine characters, but rather infantile ones, nor is the psychical change feminine, the eunuch as a rule being restful and placid. In other words, hetero-sexualism is not a feature of the eunuch. Gigantism develops, as is shown by the long-limbedness (or "Hochbeinigkeit"), and is immediately due to the persistence to a late date of separate epiphyses and the maintenance of a cartilaginous character of the epiphyseal line. In the case of the female, if the ovaries are removed before puberty, the breasts fail to develop owing to the absence of internal secretion from the ovaries, development of the breasts being quite distinct from functioning of the breasts, which is now known to depend upon biochemical stimuli derived from the fœtus.

Castration of the male before puberty results in the absence of development of secondary sex characters; the hair of the body is spare—no hair develops about the anus, and pubic and axillary hair if present are scanty. The face is beardless, but if castration is rather late there may be a marked development of the beard. The configuration of the thyroid cartilage does not become feminine, but remains childlike and no pomum Adami develops. Ossification does not take place in any part of the thyroid cartilage; the voice is a child's soprano, not a woman's. Not all eunuchs are fat, some indeed are very thin, as in the present case, though possible tuberculosis must be borne in mind. It is known that in animal castration only 50 per cent. of them develop abnormal fat. The "genital" adiposity when it occurs in eunuchs assumes the features of the fat development of women. Castration causes a reduction of oxidation of the tissues, but unlike the metabolic change following removal of the ovaries, reduced oxidation cannot be remedied in the male by extracts of the ablated organ. The architecture of the bones is profoundly altered by castration, so that they appear under X-rays to be less dense. The skull is altered in shape and becomes dolichocephalic owing to an increase of the relative maximum length. The trunk shares in no way in the increase in length shown by the limbs. Senility ultimately becomes a marked feature.

Another feature noticeable amongst eunuchs is the interesting change which is noted in other glands. In some cases the thyroid gland is reduced in size, the thymus enlarges, and the pituitary body shows increased function. It is now well known that hyperpituitarism occurring in the young not only causes gigantism, but also atrophy of the testicles and ovaries, so that we are now brought face to face with the major problem above referred to—viz., is the gigantism of the present case a direct result of testicular atrophy, or is it due to the hyperpituitarism set agoing by the testicular atrophy? It would seem that evidence is in favour of the latter probability. The absence of head symptoms and of enlargement of the sella turcica in our case in no way negatives the view, for hyperfunction of the pituitary body is in no way necessarily accompanied by enlargement of the hypophysis.

A perusal of the features met with after experimental ablation of the testicles in animals and of the description given of spontaneous atrophy of the testicles in men of the eunuchoid state shows that they are so parallel with those met with in eunuchs that we do not hesitate to say that the features of our case are really due to the testicular atrophy, and the patient may be classed as eunuchoid or as a spontaneous eunuch.

At the same time it must be admitted that if hyperpituitarism can exist without the presence of a tumour formation in the hypophysis cerebri, the above diagnosis may be wrong, seeing that a feature of primary hyperpituitarism is testicular atrophy, for this secondary testicular atrophy might quite well produce those features of a eunuch which hitherto have been and still are regarded as essential features of dysgenitalism. This very difficulty seems to remind us of the fact now being so fully admitted that several diseases at one time considered to be of uniglandular origin—e.g., Graves's disease—are, on the contrary, in reality complexes due to pluriglandular disorder.

The second question which now remains to be settled is, What is the cause of the unusual shape of the brim of the pelvis? The skiagrams show that it is narrower in the transverse diameter than it is in the antero-posterior one, and that there is a bulging inwards of the brim in the neighbourhood of the acetabula. It has already been stated that there are signs of old rickets as shown by the beading of the ribs, and it is possible that the brim of the pelvis owes its shape to this disorder. So far as we can ascertain, the pelvic brim in rickets does not assume the appearance met with in our case. We have already pointed out that observations show that in eunuchs the pelvic change is one of infantilism, but in no infant or fœtal pelvis we have examined has the configuration above described been met with.

There remain but two further possibilities which, taken in conjunction, appear to give a reasonable explanation of the abnormality. Dr. Douglas E. Derry pointed out that pelves of a similar type to that under discussion are frequently associated with kyphosis. In such cases the sacrum stands higher in the pelvis and farther back than usual, thus increasing the antero-posterior diameter, and tending to make the lumbo-sacral angle less prominent. He showed a negro pelvis which exhibits this condition in an extreme degree, and which closely resembles the shape of the inlet met with in our case in so far as the antero-posterior diameter is greater than the transverse. In such pelves the straightening of the lumbo-sacral angle is associated with a smaller anterior convexity of the lumbar portion of the spine, this recalling the conditions present in the semi-erect apes. We have seen that in our case the dorsal curvature is increased, but as there is no compensatory lordosis the conditions necessary for the production of such a form of pelvis as that described are, in Dr. Derry's opinion, satisfied.

There remains one feature, however, that is not met with in the negro pelvis nor in that of the apes and yet is present in our case, and that is the inward bending of the brim of the pelvis in the neighbourhood of the acetabula. We were inclined to think that this was due to a softening of the pelvic bones akin to osteomalacia, which yielded to the pressure transmitted by the heads of the femora. Dr. Derry's explanation is a much more likely one, and it is that the acetabular regions, which are the meeting points of three bones—the ilium, ischium, and pubic bones—have shared in the delay in union which is so marked a feature in the case of the epiphyses in other parts of our patient's skeletal system, and is so well recognized as a feature in prepuberal destruction of the testicles. This want of solidification in and about the acetabulum has led to the bone in these regions yielding to the increased thrust by the heads of the femora. So far as we know at present this abnormality has not hitherto been described in the pelvis of eunuchs.

Combined Sclerosis of the Spinal Cord and Dystrophia Adiposo-genitalis (?).

By Percy Kidd, M.D., and E. A. Tozer.

I. D., aged 5, Polish Jew, the second of three children, the other children unaffected. Father and mother healthy. There was one miscarriage between the second and third confinements. The patient is a very fat boy with olive complexion, black hair and dark almond-shaped eyes. Genital organs very undeveloped. Disposition bright, cheerful and intelligent. Speech unaffected. Cranial nerves normal. No nystagmus. Arms appear to be unaffected. Legs spastic and ataxic. Knee-jerks very glib. Ankle clonus present on left side. Plantar reflex extensor on both sides. Sensation seems unaffected. Sense of posture in the legs defective. The child is quite unable to walk or stand without assistance. When supported he walks with an ataxic gait. Incontinence of urine is present.

Mr. Roxburgh's report on the eyes: The disks are pale in contrast with the deeply pigmented fundi. He appears to have good vision and there are no signs of hemianopia.

Mr. Gilbert Scott's radiographic report on the skull: The sella turcica is very ill defined and shallow. This condition does not suggest pituitary tumour, but might be due to destruction from pressure.

Wassermann's reaction negative, both in blood and cerebrospinal fluid. No signs of disease of the thoracic or abdominal organs. Urine free from albumin.

History: The boy was quite well till the age of 16 months, when he had a succession of convulsive attacks every five minutes, lasting for twenty-four hours. Two days later a medical man diagnosed diphtheria, and the child was sent to the New Cross Fever Hospital, where he remained six weeks. On his discharge he complained of pain at the bottom of the chest and he was weak on his legs for a few days. Since that time, about every three weeks he has an attack of malaise in which he refuses to eat, "goes very yellow," has some cough, and sleeps heavily. Between the attacks he is fairly well, eats and sleeps well, sings, plays with his toys and talks intelligently. He has attended many hospitals. At the East London Hospital for Children he was said to have something wrong with his lungs. Last January he was admitted into the City Road Chest Hospital with puffiness of the face, vomiting and cough. During his stay in the hospital, which lasted nearly six weeks, ataxic symptoms were recognized and the diagnosis was nephritis—hyperemesis—cerebellar tumour (?) The parents' state that before this time the child was able to walk but that since his discharge from the hospital he has been unable to walk or stand, and incontinence of urine has been present. Subsequently he was in St. Bartholomew's Hospital and in the Hospital for Sick Children, Great Ormond Street. In the latter Hospital he was under Dr. Batten, who regarded the case as one of cerebellar tumour and advised an operation for decompression, but the parents refused permission. He was admitted into the London Hospital on September 15, 1913, under my colleague Dr. Cecil Wall, in my absence. During the seven weeks that he remained in the Hospital he had none of the attacks of malaise described by the parents. He has recently been readmitted into the hospital.

As some difference of opinion was expressed at the meeting as to the nature of the nervous affection it was arranged that the patient should be shown at a meeting of the Neurological Section on December 11.

Medical Section.

December 16, 1913.

Dr. A. E. GARROD, F.R.S., Vice-President of the Section, in the Chair.

Experiments and Observations on Yellow Fever.

By J. W. SCOTT MACFIE, M.B.,[1] and J. E. L. JOHNSTON, M.B.[1]

THE experiments and observations, of which an account follows, were undertaken by us at the Medical Research Institute at Yaba, near Lagos, during a course of an epidemic of yellow fever at Lagos, which commenced in May, 1913, and is still (September, 1913) in progress.

"It would be strange . . . ," wrote Sir Rubert Boyce (1911), "if a colony like Southern Nigeria, where the prevailing town mosquito is the *Stegomyia calopus*, and close around which the existence of yellow fever has been officially chronicled during the past fifteen years, should be exempt from endemic yellow fever"; and he proceeds to express his opinion that yellow fever is endemic, and that "the disease has long been overlooked and mistaken for other diseases." With regard to Lagos itself, Sir Rubert Boyce states that in his opinion undoubted cases of yellow fever occurred in 1894-95, and again in 1902-05. Elsewhere he says: "Examination of the medical notes in the hospital at Lagos convinces me that genuine well-marked cases of yellow fever occurred in the years 1902-05; there were also many mild cases"; and: "When it is recollected how little is known of the fevers amongst the 60,000 native inhabitants of Lagos, and when it is understood that by far the most abundant mosquito is the Stegomyia, it is not unreasonable to assume that the natives in all probability suffer from a mild type of yellow fever, and that, therefore, yellow fever is endemic." It is also of interest to note that Syrian residents in Lagos have long recognized a fatal disease that attacked their countrymen soon after their arrival, a disease that was characterized by remittent fever, vomiting and jaundice.

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[1] West African Medical Staff.

In May, 1913, a case of undoubted yellow fever occurred in a European at Lagos, and five suspicious cases, four in natives and one in a European, followed at about the same time. Two months later another series of cases occurred. Two of the patients were Europeans, three Syrians, and twelve natives. During the latter outbreak we had the opportunity of carrying out the experiments which form the subject of this paper.

TABLE I.—YELLOW FEVER CASES IN LAGOS, 1913.

CASE					SYMPTOMS AND SIGNS											
No.	Race	Result	Mild or severe	Duration in days	Chills or rigors	Headache	Pains in loins and limbs	Conjunctival injection	Day on which jaundice appeared	Epigastric tenderness	Vomiting	Melæna	Faget's sign or slow pulse	Albuminuria	Number of days of albuminuria	Hæmorrhages from gums, &c.
								Europeans.								
14	British	D	S	5	...	+	+	+	4	+	+	+	+	+	...	+
36	German	R	M	9+	...	+	+	+	+	−	+	+	...	+	...	+
37	British	D	S	5	+	+	+	+	5	+	+	+	+	+	4	+
44	,,	R	M	18	+	+	+	+	4	+	−	−	+	+	5	−
								Other Non-natives.								
38	Syrian	D	S	5	+	+	+	+	5	+	+	+	+	+	3	+
39	,,	R	S	23	+	+	+	+	5	+	+	−	+	+	5	+
41	,,	D	S	5	+	+	+	+	4	+	+	+	+	+	(?) 4	+
								Natives.								
23	Egba	R	M	25	+	+	+	+	9	+	−	−	+	+	...	−
24	Yoruba	R	M	20	+	+	+	+	8	−	−	−	−	+	...	−
25	Ibo	R	M	21	...	+	+	+	8	+	−	−	+	+	...	−
35	Kroo-boy	R	M	22	...	+	+	+	+	+	−	−	...	+	...	−
40	Yoruba	R	S	26	+	+	+	+	7	+	−	−	+	+	4	−
42	Kroo-boy	R	M	19	+	+	...	+	7	−	−	−	+	+	7	−
43	Yoruba	R	M	24	+	+	+	+	7	+	−	−	+	+	7	−
45	Beni	R	M	17	+	+	+	+	5	−	−	−	+	+	5	−
46	Kroo-boy	R	M	23	+	+	...	+	3	−	−	−	+	+	6	−
47	Yoruba	R	M	12	+	+	...	+	6	−	−	−	+	+	7	−
51	Kroo-boy	R	M	16	+	+	+	+	6	−	−	−	+	+	5	−
52	,,	R	M	15	+	+	+	+	5	−	−	−	+	+	5	−
53	,,	R	M	13	+	+	+	+	6	+	−	−	+	+	5	−
55	Yoruba	R	M	21	...	+	+	+	8	−	−	−	+	+	4	−
56	,,	R	M	15	+	+	+	+	6	+	+	−	+	+	4	−
63	Sobo	R	S	25	+	+	+	+	11	+	−	−	+	+	6	−

R = recovery; D = death; M = mild; S = severe; + = present; − = absent.

OBSERVATIONS ON MAN.

Symptoms.

A short account should be given of the symptoms presented by the patients suffering from yellow fever at Lagos before proceeding with the experiments that form the particular subject of this article. We are greatly indebted to Dr. Leonard for putting at our disposal the careful records he kept of the cases, from which we have compiled the following summary.

The cases fall chronologically into two groups. The first six occurred in May and the remaining seventeen in July and August. Each group was ushered in by a fatal case in a European. Taking the cases as a whole up to the date of writing (September, 1913), four have occurred in Europeans, sixteen in natives, and three in Syrians. It is, perhaps, a fact of some significance that six of the native cases occurred in Kroo-boys.

In Europeans the disease presented all the classical features. Two of the cases terminated fatally, and the pathological and post-mortem appearances confirmed the clinical diagnosis. Jaundice was observed on the fourth or fifth day of the disease; vomiting, described as "black" in two, and "brown" in one, occurred in three out of the four cases; and melæna, and hæmorrhages from various mucous membranes, were noticed in the same three patients.

Of the three Syrians attacked, two died on the fifth day of the disease, and the third case, though not fatal, was of a serious type. Vomiting was a prominent symptom in each, and all the typical symptoms were observed in the fatal cases. The organs from the fatal cases were found on examination to present the histological changes that one would expect to find in cases of yellow fever.

In the native cases, some of which were complicated by a concurrent malarial infection, the symptoms were variable and, as a rule, not severe. In many instances the disease was characterized solely by fever, jaundice, and albuminuria. In practically all the native patients the disease was of a mild type. There were no deaths. One of the most severe cases (No. 40) was detected in the routine examination of the passengers travelling on the railway trains. This patient apparently felt quite able to undertake a long journey. The fever was moderate in degree; the premonitory symptoms only such as occur in natives with any form of pyrexia; epigastric tenderness was by no means a constant symptom; vomiting occurred in only one case; and melæna and hæmorrhages were never observed. Jaundice was perceptible as a rule on the sixth or seventh day; but this symptom is difficult to observe in a negro, and must be considered somewhat unsatisfactory. The same remarks apply to conjunctival injection. A secondary low pulse-rate, or a definite Faget's sign, was almost invariably present. Albuminuria, which persisted for from four to seven days, was the most important symptom, and was present in every case. According to the opinion of those who have had the best opportunity for making the observations, it is rare in Nigeria to find albuminuria in a native suffering from malaria, at any rate with the degree of fever met with in these cases.

The symptoms in natives were therefore far from typical. This, however, is rather the rule than the exception. Seidelin (1912) writes: "The occurrence of typical cases in natives is, however, always exceptional. This fact is, according to the now generally accepted opinion, due to the coincidence of two circumstances: that yellow fever in children as a rule is observed in typical, and often benign forms, and that practically all natives are attacked in childhood." Seidelin is here referring to his experiences in Yucatan, but it seems probable that his statements would apply equally well to West Africa. It has not been possible hitherto to investigate the disease of children in West Africa in a satisfactory manner, owing to the reluctance of the natives to consult European medical officers in regard to the so-called "childish ailments." It is probable that until certification of the cause of death is made compulsory in the larger towns of Nigeria the matter must remain undecided. Under these circumstances, as Seidelin points out, the demonstration of the supposed parasite would be of the utmost importance in studying the anomalous features of the epidemiology of yellow fever.

The Occurrence of Paraplasma-like Bodies in the Blood.

We have had the opportunity of examining the blood films from nineteen cases of yellow fever (*see* Table II); in sixteen we have detected *paraplasma*-like bodies in the red blood cells. The films were stained deeply, in most cases by Leishman's method, but in a few by Giemsa's. The single blood films forwarded to us from two cases (Nos. 41 and 44) were unfortunately unsuitable for examination for minute parasites, and the same remark applies to the films received from Case 54.

In our earlier examinations we observed some simple ring-shaped bodies that stained blue. These were present not only in the red blood corpuscles but also free in the plasma. No chromatin granule could be detected, and although this fact would have been hard to explain were these bodies of a parasitic nature, we considered that the question of their occurrence was worthy of further investigation. Seidelin (1911) has figured bodies presenting very much the same appearance and has called them "protoplasma bodies without chromatin." He has suggested that "the absence of a definite chromatin staining . . . is probably a phenomenon of degeneration." In one of the first cases examined these bodies were common; but in subsequent cases, although they were occasionally met with, they did not occur with that regularity that one would have expected had they been definitely associated with the cause of the disease. We are therefore inclined to think that they are not of great importance, and although we consider that they may be associated with yellow fever in some manner that is not understood, we do not believe that they are directly concerned in the ætiology of the disease.

TABLE II.—SYNOPSIS OF THE YELLOW FEVER CASES EXAMINED.

YELLOW FEVER CASE				Remarks
Commission No.	Place	Race	Result	
37	Lagos	British	Death	Paraplasma-like bodies present in the blood
38	,,	Syrian	,,	,, ,, ,,
39	,,	,,	Recovery	,, ,, ,,
40	,,	Yoruba	,,	,, ,, ,,
41	,,	Syrian	Death	Blood films unsuitable for examination for minute bodies
42	,,	Kroo-boy	Recovery	Paraplasma-like bodies present in the blood
43	,,	Yoruba	,,	,, ,, ,,
44	,,	British	,,	Blood films unsuitable for examination for minute bodies
45	,,	Beni	,,	Paraplasma-like bodies present in the blood
46	,,	Kroo-boy	,,	,, ,, ,,
47	,,	Yoruba	,,	,, ,, ,,
51	,,	Kroo-boy	,,	,, ,, ,,
52	,,	,,	,,	,, ,, ,,
53	,,	,,	,,	,, ,, ,,
54	Aro	Syrian	,,	Blood films unsuitable for examination for minute bodies
55	Lagos	Yoruba	,,	Paraplasma-like bodies present in the blood
56	,,	,,	,,	,, ,, ,,
62	Forcados	Igabo	,,	,, ,, ,,
63	Lagos	Sobo	,,	,, ,, ,,

In all those cases of yellow fever from which we have had the opportunity of examining satisfactory blood films we have detected the presence of minute endoglobular bodies resembling the *Paraplasma flavigenum* of Seidelin. In some cases they were very scarce, but in others they were by no means rare. They were, for instance, more common than malarial parasites are in adult natives suffering from mild attacks of malarial fever, in whom it is often extremely difficult to find conclusive evidence of infection, the parasites being sometimes detected only after examining several blood films, or by employing the thick film method.

The figures we show represent different forms of bodies found on successive days in a single case of yellow fever in a native (fig. 1). In this case blood films were obtained daily from the first day of the disease until the twelfth day when convalescence was apparently complete. It is noteworthy that the bodies were found on eleven out of the twelve days of the illness, and that they persisted after the subsidence of the fever. This fact is not, of course, exceptional for protozoal diseases of a chronic type, although at first sight it seems remarkable in an acute febrile disorder like yellow fever, which, moreover, is said to be infective only during the first three days. It should be remembered, however, that, as Seidelin has pointed out, this belief rests on a very flimsy basis of fact, and cannot be considered as yet to have received satisfactory scientific proof. It is possible that the persistence of these bodies in the blood during convalescence may explain some of the obscure features of the epidemiology.

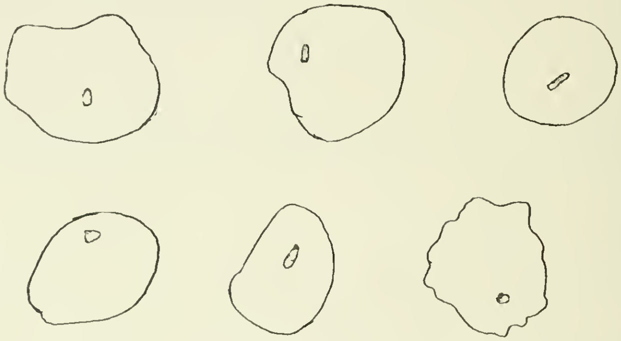

FIG. 1.

Figures showing forms in a single case in a native. (Roughly × 2,000.)

We now show some other forms of these bodies encountered in the blood of yellow fever patients and in experimental animals (figs. 2 to 5). The earliest form consists of a mere dot of chromatin with a small blue-stained body. In later stages the size of the blue-stained body

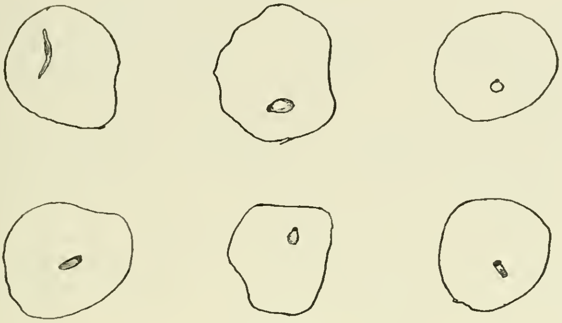

Fig. 2.
Figures from other human cases.

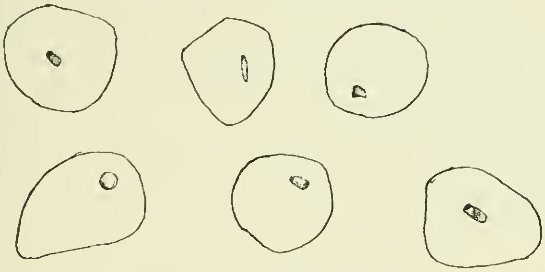

Fig. 3.
Figures from guinea-pigs.

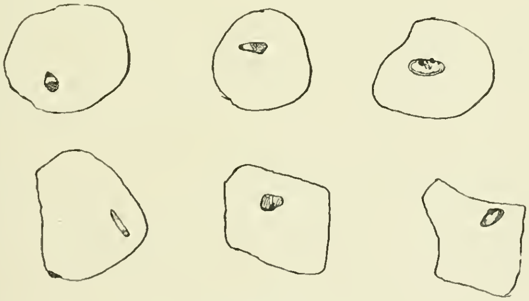

Fig. 4.
Figures from dogs.

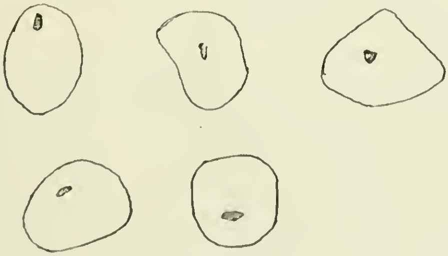

Fig. 5.
Figures from rats.

increases, until a definite ring form is developed. Several stages of this phase are figured. Ultimately a body of relatively considerable size is produced.

The general resemblance of these bodies to the *Paraplasma flavigenum* of Seidelin cannot be denied. We have found the same forms, and although we have not been able to make out a definite cycle of development, the types of body illustrated have been constant in our cases. We are aware that Seidelin's bodies have been severely criticized by various authors, but we are nevertheless inclined to the belief that they are parasites. We are of opinion that the constancy with which they are found in the blood of yellow fever patients is a matter of considerable importance, and should be a valuable aid to the diagnosis of doubtful cases. The experiments on animals, of which

TABLE III.—SYNOPSIS OF THE EXPERIMENTS ON ANIMALS.

CASE			Day of the disease on which inoculations were made	ANIMAL REACTIONS					
				Guinea-pig		Dog		Rat	
Com-mission No.	Race	Result		Febrile reaction	Paraplasma-like bodies	Febrile reaction	Paraplasma-like bodies	Febrile reaction	Paraplasma-like bodies
41	Syrian	Death	3	–	–	–	–	...	...
42	Kroo-boy	Recovery	8	+	+	–	+	...	...
43	Yoruba	,,	6	+	+	–	+	...	...
44	British	,,	8	+	+	...	...	...	...
45	Beni	,,	5	+	+	–	+	..	...
47	Yoruba	,,	3	+	+	...	...	...	...
51	Kroo-boy	,,	2	+	+	...	...	...	...
52	,,	,,	2	–	+	...	...	...	...
53	,,	,,	2	–	+	...	...	...	...
55	Yoruba	,,	4 or 5	+	+	...	...	–	+
56	,,	,,	1	–	+	–	+	+	+
..	...	...	1	+	+	...	...	...	...
...	...	...	1	+	+	...	...	...	...
...	...	...	6	+	+	...	...	...	...

+ = present ; – = absent.

an account follows, supply, in our opinion, confirmation of the parasitic theory. It would be a remarkable coincidence if bodies of this type were found in human blood from a case of yellow fever, and in the blood of guinea-pigs and dogs inoculated with it, were they not specifically related to the disease. As regards the biological nature of these bodies, we agree with Seidelin in regarding them as belonging to the *Babesiidæ*. The cycle undergone by the parasite cannot at present be described in detail, several different forms occurring in the blood at the same time, and unfortunately it has been impossible for us to carry out any experiments with infected mosquitoes.

OBSERVATIONS ON GUINEA-PIGS.

Thomas (1907) succeeded in producing a reaction in guinea-pigs from four and a half to thirteen days after being bitten by infected stegomyia, and Seidelin (1912) observed intracorpuscular bodies resembling *Paraplasma flavigenum* in two guinea-pigs which he had inoculated from a case of yellow fever. We therefore decided to attempt the infection of guinea-pigs by inoculation from the yellow fever cases at Lagos.

The details of the experiments were as follows:—

Guinea-pig 49: Inoculated from Case 41, a Syrian, on the third day of his disease. No febrile reaction was observed in this animal during the eighteen days it was under observation, and no paraplasma-like bodies were found in the red blood corpuscles. Phagocytosis of the red cells by what appeared to be large mononuclear leucocytes was, however, observed in this animal.

Guinea-pig 56: Inoculated from Case 42, a Kroo-boy, on the eighth day of his disease. On the third day the guinea-pig's temperature began to rise, reached its maximum on the fourth day, remained somewhat high until the eleventh day, and then fell to normal. Paraplasma-like bodies were found in the red blood cells. On the thirty-eighth day the guinea-pig was found dead. On examining the body the liver was seen to be small and of a deep red colour; the gall-bladder was distended; there was some free ascitic fluid, and the kidneys were dark. The other organs appeared to be healthy, and no obvious cause of death was detected. A small quantity of urine from the bladder was found to contain albumin. On microscopical examination the liver was found to be intensely congested; the kidneys also were congested; many small hæmorrhages had taken place, the tubules contained débris, the lining epithelium was swollen, and the protoplasm of the cells was granular; the glomeruli were congested, and in some places degenerated.

Guinea-pig 63 was injected from guinea-pig 56 on the sixth day. On the following day the guinea-pig had a well-marked febrile reaction and the fever did not ultimately subside until the fourteenth day. Paraplasma-like bodies were present in the blood.

Guinea-pig 57: Inoculated from Case 43, a Yoruba, on the sixth day of his illness. The guinea-pig showed a well-marked febrile reaction lasting for thirteen days. Paraplasma-like bodies were found in the blood. On the twentieth day the guinea-pig died suddenly. On examining the body there was found œdema of the abdominal walls, the abdominal cavity contained a fair quantity of ascitic fluid, the liver was large and the gall-bladder distended, and the kidneys also were increased in size. Some urine obtained from the bladder was found to contain a trace of albumin. On microscopical examination the liver was found to be acutely congested; the kidney was acutely congested, there were some hæmorrhages, and the renal cells were swollen.

Guinea-pig 58: Inoculated from Case 45, a Beni, on the fifth day of his illness. On the following day the guinea-pig had well-marked fever which fell slowly until it reached a normal level on the thirteenth day. Paraplasma-like bodies were found in the blood.

Guinea-pig 59: Inoculated from Case 44, a European, on the eighth day of his illness. On the following day there was well-marked fever which persisted with some irregularity until the eleventh or twelfth day. Paraplasma-like bodies were found in the blood.

Guinea-pig 64: Inoculated from Case 47, a Yoruba, on the third day of his illness. The temperature of this animal did not begin to rise until the fourth day, and the febrile reaction was never pronounced, but paraplasma-like bodies were found in the blood.

Guinea-pig 67: Inoculated from Case 51, a Kroo-boy, on the second day of his illness. The febrile reaction in this animal was but a slight one, the highest point reached being on the fourth day. Paraplasma-like bodies were found in the blood.

Guinea-pig 69: Inoculated from Case 52, a Kroo-boy, on the second day of his illness. The temperature of this animal never rose above 101·2° F., and it cannot therefore be said to have shown any definite febrile reaction. Paraplasma-like bodies were, nevertheless, found in its blood.

Guinea-pig 73: Inoculated from Case 53, a Kroo-boy, on the second day of his illness. As in the previous animal, no febrile reaction occurred, but paraplasma-like bodies were found to be present in the blood.

Guinea-pig 79: Inoculated from Case 55, a Yoruba, on the fourth or fifth day of his illness. This guinea-pig showed a well-marked febrile reaction, but the temperature seemed to have returned to normal about the seventh or eighth day. Paraplasma-like bodies were found in the blood. On the morning of the fifteenth day the guinea-pig appeared to be in good health; a few minutes later it was found lying down as if its legs had given way under it; within a few minutes it was able to sit up, and presented a curious appearance with its head sunk between its shoulders. Its temperature was below 95° F. During the course of the day it recovered, and at 5 p.m. its temperature was 100° F. On the following morning the guinea-pig was found in a dying condition; it died at 8 a.m. On examining the body the organs did not appear to be severely affected. The liver was large and red, the kidneys were congested, and the mucous membrane of the stomach was a little congested; the urine in the bladder was free from albumin. On microscopical examination the liver was found to be congested, the hepatic cells somewhat swollen and their protoplasm granular. The kidney was congested, a number of small hæmorrhages had taken place, the tubules contained a little débris, and their lining epithelium was somewhat swollen. No gross changes were observable in the heart; the protoplasm of the muscle-fibres was, however, rather granular.

Guinea-pig 92: Inoculated from Case 56, a Yoruba, on the first day of his illness. On the fourth day the guinea-pig showed a very slight rise of temperature. A few paraplasma-like bodies were found in the blood, and phagocytosis of the red blood corpuscles was seen to have occurred. On the sixth day the guinea-pig was killed for the purpose of examining its organs. On opening the body the liver was found to be large and of a dark colour. No obvious morbid conditions were present. On microscopical examination the liver was found to be congested, the hepatic cells were granular and appeared to be degenerated. The kidney was congested, the tubules contained débris, and the lining epithelium was swollen and granular. The lungs were congested and their alveoli contained some débris.

Guinea-pig 94: Inoculated from Case 56, a Yoruba, on the first day of his illness. This guinea-pig showed a moderate febrile reaction, and paraplasma-like bodies were found in the blood.

Guinea-pig 95: Inoculated from Case 56, a Yoruba, on the first day of his illness. This guinea-pig showed a moderate febrile reaction, and paraplasma-like bodies were found in the blood.

Guinea-pig 103: Inoculated from Case 56, a Yoruba, on the sixth day of his illness. The animal showed a definite but somewhat irregular febrile reaction, and paraplasma-like bodies were found in its blood.

Fourteen guinea-pigs were thus inoculated from eleven cases. A single animal was injected from each of the first ten cases, and four animals from the eleventh. In each case only one or two drops of blood diluted with 1 per cent. sodium citrate solution were used for the injection, which was made subcutaneously. Ten of the animals showed a definite febrile reaction. Three guinea-pigs that were inoculated in a similar manner with normal human blood did not show any such reaction. Positive results have been obtained by inoculations made as late as the eighth day of the disease. In the above table (Table III) particulars of the experiments will be found; and the four temperature charts reproduced illustrate the nature of the febrile reaction. The temperatures of all the animals were taken *per rectum* daily, at 5 p.m.

Seidelin in his experiments observed that there were slight oscillations of the body temperatures during the first seven days following the injections, whilst distinctly higher temperatures were recorded later. He was doubtful, however, whether this apparent rise could be considered of much importance, as he found considerable variations of the temperature in healthy guinea-pigs, and because he had discovered that sufficient care had not been taken in recording the temperatures of his experimental animals. These objections cannot be raised in the case of our guinea-pigs, which showed a well-defined febrile reaction following inoculation. The guinea-pigs did not appear to suffer from any other symptoms of disease, but it is often difficult to detect signs of illness in these small animals. Three guinea-pigs (Nos. 56, 57, 79), however, died suddenly on the thirty-eighth, twentieth, and sixteenth day after inoculation respectively. All three had shown a well-marked febrile reaction (*see* Charts 1, 2, and 4), but their temperatures had returned to normal some time before their deaths occurred. Details of the post-mortem appearances and the pathological conditions of the organs will be found above, but we may state again that in all three the liver was congested and that the kidneys showed signs of parenchymatous nephritis. In two the urine obtained from the bladder was albuminous. As no other deaths occurred among our stock of guinea-pigs at the same time, it would appear probable that the fatal results in these three animals must be attributed to the effects produced in them by the inoculations with yellow fever blood.

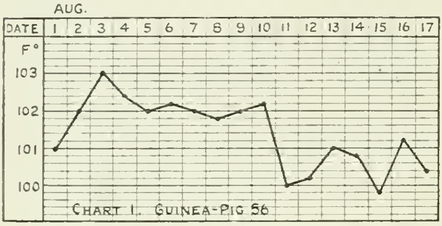

CHART 1. GUINEA-PIG 56

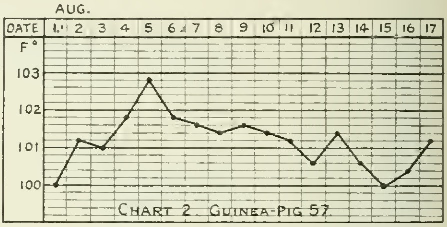

CHART 2. GUINEA-PIG 57.

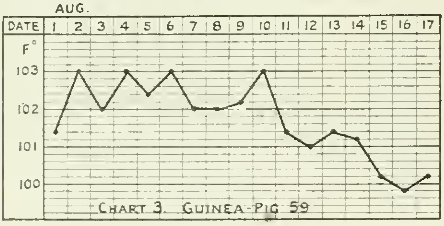

CHART 3. GUINEA-PIG 59

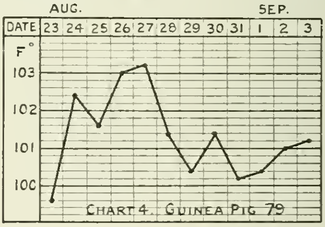

CHART 4. GUINEA PIG 79

Four of the guinea-pigs inoculated failed to show any definite febrile reaction. In two of these at any rate auto-erythro-phagocytosis was observed. Elsewhere (1913) we have suggested that the phenomenon of auto-erythro-phagocytosis seems to be peculiarly associated with protozoal diseases. Connal (1912), moreover, has suggested that the ingestion of red cells by macrophages may be a natural reaction of the host to combat an infection. In these guinea-pigs, therefore, the occurrence of this phenomenon may have indicated a successful reaction on the part of the host, and may thus explain the absence of fever, the attacks being, in short, aborted. That the animals were infected we believed to be proved by the fact that we detected in the blood of three of them the paraplasma-like bodies that we have found associated with yellow fever.

In all the guinea-pigs inoculated, with the single exception of the first (No. 49), bodies were found closely resembling the paraplasma-like bodies present in the blood from the human cases. No such bodies were found in healthy guinea-pigs, nor were they present in the blood of the animals before inoculation. Seidelin found similar elements in the blood of two of his inoculated guinea-pigs, and states that "their resemblance to *Paraplasma flavigenum* is also very great." He considers the question of their being a Babesia such as that described by Baldrey; and also the possibility that they may have been some yellow fever parasites, introduced at the time of inoculation, that had succeeded in surviving in the human blood corpuscles which had been injected. The latter consideration cannot apply in our cases, as the quantity of human blood injected was in every case exceedingly small, and was not introduced directly into the blood-stream of the animals. It seems inevitable, therefore, to conclude that these bodies must have been developed in the blood of the guinea-pigs.

In one case a sub-inoculation was made. One or two drops of blood were obtained from guinea-pig No. 56, which had been inoculated from a yellow fever case (No. 42), on the sixth day after inoculation, and whilst it still showed some degree of fever, and were injected into guinea-pig No. 63. The latter guinea-pig showed a well-marked, although somewhat irregular, febrile reaction, and on examining its blood paraplasma-like bodies were found to be present.

OBSERVATIONS ON DOGS.

A paragraph in Castellani and Chalmer's "Manual of Tropical Medicine" (1912) suggested to us that it might be of some interest to perform some experiments with dogs. These authors wrote: "It is well to remember that in yellow fever epidemics it is stated that dogs and fowls are supposed to be ill, but from what cause is unknown. Manson has suggested that the disease may be kept up by animals." We have failed to find any reference to this sickness amongst dogs in the literature at our disposal; neither have we come across any accounts of experiments with these animals. We have inoculated subcutaneously five dogs with blood obtained from yellow fever patients. Young puppies were chosen for this purpose, as it was thought possible that older dogs might have acquired some degree of immunity to the disease. The details of the experiments were as follows:—

Dog 50: Inoculated from Case 41, a Syrian, on the third day of his disease. The puppy remained in good health, no febrile reaction was observed, and no paraplasma-like bodies were found in the blood.

Dog 53: Inoculated from Case 42, a Kroo-boy, on the eighth day of his illness. The dog remained in good health, no febrile reaction was observed, but paraplasma-like bodies were found to be present in the blood.

Dog 54: Inoculated from Case 43, a Yoruba, on the sixth day of his illness. The dog remained in good health, no febrile reaction was observed, but paraplasma-like bodies were found in the blood.

Dog 55: Inoculated from Case 45, a Beni, on the fifth day of his illness. The dog remained in good health, no febrile reaction was observed, but paraplasma-like bodies were found in the blood.

Dog 96: Inoculated from Case 56, a Yoruba, on the first day of his illness. No febrile reaction was observed, but paraplasma-like bodies were found in the blood. The dog, unfortunately, developed distemper and mange and was killed on the fifth day. On examining the body the liver was found to be large and of a deep red colour. The gall-bladder was distended with green bile. The kidneys were dark. The spleen appeared to be normal. The mesenteric glands were much enlarged. The stomach contained much mucus, the lining membrane was catarrhal and a few pinkish spots were observed on it. The small intestine was full of parasitic worms. The lower part of the gut was free from these parasites, but was full of a dark brown material. On microscopical examination the liver cells, practically throughout the organ, contained fat globules. Many of the cells contained several globules, and the remaining protoplasm was granular. The tubules of the kidney were filled with granular débris, the lining epithelium was swollen, and the cells were granular and in some places contained fat. A few small hæmorrhages were present.

None of the animals, therefore, showed any febrile reaction, their temperatures remained steady, and they did not appear to suffer any symptoms as a result of the inoculations. Nevertheless, on examining blood films paraplasma-like bodies were detected in four out of the five puppies. The pathological conditions found at the examination of dog 96 were probably the result of intercurrent disease, but it is impossible to be certain whether or not they were entirely so.

We have also examined eleven stray dogs from Lagos that had been procured for us by the police. In the blood of two of these Babesia-like or paraplasma-like bodies were found. One of these dogs, No. 81, was of considerable interest. Dr. Kapo, in forwarding to us the blood films, reported that the dog was in a dying condition when he saw it; and Dr. Leonard further informed us that the animal, which had meanwhile been destroyed, as it appeared to be in great pain, had had convulsions, and had passed some tarry fæces. Dr. Leonard very kindly made a post-mortem examination, and forwarded to us a kidney, a piece of the liver, and some urine from the bladder. With regard to the post-mortem appearances, he stated that there was no obvious cause of death, but that the liver appeared to be fatty, and that the bowel was full of a dark material. On examination the urine was found to be acid and to contain albumin; the liver was congested, and a few of the hepatic cells contained fat globules; and in the kidneys the tubular epithelium was swollen, the tubules were full of granular débris, the cells in some places had undergone degeneration, and the blood-vessels were engorged. In the blood films taken shortly before the animal was destroyed a number of intracorpuscular bodies showing well-defined red granules and distinct blue-stained bodies were found. None of the bodies corresponded to the type of *Babesia canis*, but one appeared by its large size to differ from *Paraplasma flavigenum*, and it is possible that an infection with another species of Babesia may have been present. The histological condition of the liver of this dog was very different from that found in such diseases as distemper, in which fatty degeneration occurs. The first disease that suggested itself as having been the cause of the illness was, of course, Babesiasis. The post-mortem appearances in animals that have died from *Babesia canis* are, however, different from those met with in this case, and the histological lesions are dissimilar. In Babesiasis the central vein and the interlobular capillaries of the liver are much dilated, and also the intralobular vessels. The fibrous tissue is normal, but the liver cells are distorted, and in many cases destroyed. The kidneys only show dilatation of the blood-vessels. It is, perhaps, too much to suppose that this dog suffered from yellow fever, but in some respects the pathological conditions suggested this disease, and the occurrence of a few Babesia-like bodies in the red blood corpuscles, which were very like the paraplasma bodies found in the dogs inoculated from cases of yellow fever, may be considered to support this hypothesis.

Our observations on this point have been too few and too incomplete to justify any conclusions. The two dogs referred to certainly appeared to be naturally affected with a Babesia resembling the *Paraplasma flavigenum*. It is, of course, possible that the parasite was of another nature; but so far as we are aware no Babesia of dogs has hitherto been described presenting the appearance of that observed by us.

The experiments on puppies, already referred to, further suggest that it might be possible for dogs to be naturally infected with yellow fever, and, although harbouring the parasite in their blood, to exhibit no symptoms of the disease. In this way they might conceivably become a reservoir of yellow fever, and the disease might be maintained in them.

Observations on Rats.

A stock of white rats having reached us from England, we were able to inoculate these animals from two of the last cases of yellow fever.

Rat 78: Inoculated from Case 55, a Yoruba, on the fourth or fifth day of his illness. The animal showed no febrile reaction, and did not appear to be in any way affected by the injection. Paraplasma-like bodies were, however, found in the blood.

Rat 92: Inoculated from Case 56, a Yoruba, on the first day of his illness. On the fourth and fifth days the animal showed some degree of fever, and paraplasma-like bodies were found in the blood.

These two experiments, as far as they go, tend to show that rats are less susceptible than guinea-pigs to inoculation with blood from yellow fever patients. The temperature chart of the one rat that appeared to show some reaction is reproduced below (Chart 5) for comparison with reaction in guinea-pigs.

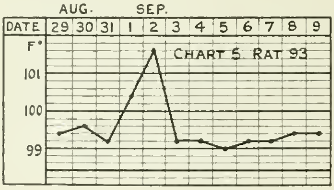

CHART 5. RAT 93

Observations on Fowls.

The statement made by Castellani and Chalmers, referred to above, to the effect that fowls are supposed to be ill during epidemics of yellow fever, led us to examine a few birds for the presence of paraplasma-like bodies in the blood. For this purpose six fowls were bought at one of the Lagos markets. They were selected at random and were a somewhat poor-looking lot. The examination of their bloods was negative.

No disease of fowls in the least suggestive of yellow fever has been reported to us during the recent outbreak of yellow fever in Lagos. The only illness that has come under our notice during this time has been spirochætosis.

MISCELLANEOUS OBSERVATIONS.

The Action of Atoxyl.—It has been suggested, naturally, that atoxyl, which has proved so beneficial in certain other protozoal diseases, might also be of value in the treatment of yellow fever. On account of the toxic properties of this drug some reluctance might be felt in employing it in human cases, and it is therefore of the utmost importance to carry out therapeutic experiments with it in animals. It occurred to us that, as we had obtained febrile reactions in guinea-pigs following inoculation with the blood from yellow fever patients, it might be possible to test the efficacy of this drug on them. Two guinea-pigs (Nos. 94 and 95) were therefore inoculated with blood from the yellow fever Case 56 on the first day of the disease. On the fifth day both animals showed a well-marked febrile reaction. One of them, No. 94, was then injected subcutaneously with $\frac{1}{50}$ gr. of atoxyl. No marked difference was observable in the subsequent course of the fever in these two animals. In each of them the temperature gradually returned to normal. The temperature charts are reproduced below for comparison.

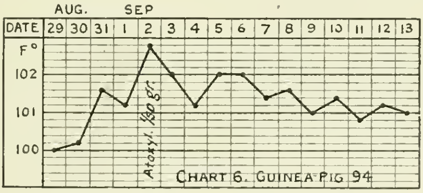

CHART 6. GUINEA PIG 94

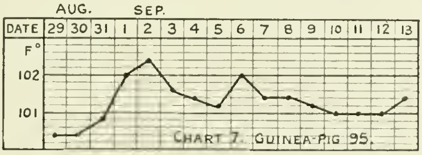

CHART 7. GUINEA PIG 95.

Unfortunately for our purposes, this was the last case of yellow fever from which we were able to perform experiments, and we were therefore unable to make further observations on the action of atoxyl, and, as we had hoped to, on that of salvarsan. We had also contemplated trying the effect of trypan blue, which has been found by Nuttall and Hadwen (1909) to be a specific in canine Babesiasis.

Cultivation Experiment. — The success of Bass and subsequent workers in cultivating the malarial parasite and the Babesia suggested that, if yellow fever were due to an infection with a Babesia-like organism, it might be possible to demonstrate it by this means. In one case we were able to obtain sufficient blood to attempt cultivation.

The technique observed was that described by Thompson, McLellan and Ross (1912). The experiment was unsuccessful, and no growth of protozoal organisms was observed.

Wassermann's Reaction.—In two cases the Wassermann test was carried out. The technique employed was that described by Fleming (1909). In the one it was tried on the fifth day, but in the other, unfortunately, it was impossible to attempt it before the tenth day of the illness. The observations are too few to be of any value, but it may be recorded that both were negative. Our results are similar to those obtained in Yucatan by Seidelin (1912). In two of his cases the test was negative, and in one which was positive he suggests that this result may have been due to a previous syphilitic infection.

SUMMARY.

In 1909 Seidelin described bodies in the blood of yellow fever patients which he believed to be the parasite of the disease, and he has since published a series of papers on the same subject. As far as we are aware, his observations have so far only been confirmed by Hernandez (1912).

On commencing our investigations at Lagos we were first at a disadvantage, for we had not seen specimens of these bodies. It was not long, however, before we discovered in the red corpuscles bodies which we believed to be identical with the *Paraplasma flavigenum* of Seidelin.[1] We have found these elements in practically every case of yellow fever we have examined, and also in guinea-pigs, dogs and rats that had been inoculated from human cases. We have found guinea-pigs the most susceptible of the animals with which we have experimented, and we have succeeded in conveying the paraplasma-bodies by sub-inoculation. The crucial experiment of reinfecting man by inoculating with the blood of an infected guinea-pig we have not been able to perform.

These paraplasma bodies are by no means always scanty. They are as a rule sufficiently numerous to be a valuable aid in diagnosis, as we have already experienced, and further, an assistance in the study of yellow fever. Thus we have found them in the blood some days after the subsidence of the fever when the patient was apparently convalescent, and we have succeeded in infecting guinea-pigs by inoculation made as late as the eighth day.

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[1] Since writing the above Dr. Seidelin has very kindly examined a number of our blood films, and has confirmed our view that the bodies are identical with the *Paraplasma flavigenum*. He has also permitted us to examine some of his typical specimens, and we have thus been confirmed in our opinion stated above.

Now, in natives yellow fever is often a mild, almost trivial, illness, and patients often insist that they feel well after but one or two days in hospital. In their own homes they would, no doubt, go about freely at this stage of the disease, whilst the paraplasma bodies are still to be found in the blood. If, as we believe, these bodies are the parasites of yellow fever, these patients should be capable of infecting mosquitoes and of further spreading the disease. In other words, the patient would be infectious for longer than the generally ascribed period of three days.

The successful inoculation of dogs and rats suggests a possible subsidiary means by which the disease may be kept endemic, in spite of stringent sanitary regulations. Moreover, the successful inoculation of laboratory animals opens the way to an exact study of the ætiology of yellow fever, of the parasite of the disease and its cycle in its vertebrate and invertebrate hosts, and of the therapeutic effects of various drugs.

We wish to express our sincere thanks to Dr. T. Russell Leonard for permitting us to make use of his observations on the cases under his care and for inoculating for us some of the animals. We have also great pleasure in acknowledging our indebtedness to Sergeant F. G. Phipps, R.A.M.C., for the careful way in which he has looked after our experimental animals and for his invaluable assistance throughout our investigations.

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Tuberculous Rheumatism.

By Nathan Raw, M.D.

The case that I am about to relate to you is one of great rarity, and may well merit some attention from this important Society. Tuberculous rheumatism was first described by Poncet of Lyons, and other French physicians, such as Bérard, Mailland, Bézançon, and Griffon, have reported cases from their own researches, but, so far, British physicians have not described the condition in detail. The articular lesions in infective diseases such as gonorrhœa, dysentery, syphilis, pneumonia, &c., are quite different from the pseudo-rheumatic arthritic lesions observed in some forms of tuberculosis. In an observation of over 6,000 cases of pulmonary tuberculosis under my care in hospital and elsewhere I have not met with a single case of tuberculous rheumatism, at least it was not recognized as such, and although it is very common to see cases of tuberculous arthritis attacking one or perhaps more joints, it is most rare to meet with a multiple arthritis of the smaller joints in the hands, fingers, wrists, and ankles in the course of tuberculosis.

The subject of this paper is a young lady, aged 19, of healthy parents. She has several sisters, all of whom are healthy. I am told that she was always, as a child, very fond of milk, and drank large quantities; at the age of 13 she first developed tuberculous glands in the left side of the neck. These gradually spread down to the clavicle into the submaxillary regions and to the right side. The infection was slowly progressive, until both sides of the neck were much swollen and very painful. Her general health became seriously affected and she lost weight rapidly. Every remedy was adopted, but nothing seemed to check the infection. At last, five years after the first onset, the glands in the original focus showed signs of breaking down, and it was decided to open and remove the contents of all the suppurating glands. This was done by Mr. Thelwall Thomas, but it was impossible to remove any glands, so firmly were they fixed to everything in the neck. A month after the operation she developed a painless, rapid effusion into the right wrist-joint, followed in a week by a similar condition in the left wrist, and followed again by swelling of all the metacarpo-phalangeal joints of both hands. There was very little pain, but the temperature was high, 102° F. at night and 99° F. in the morning for ten days. Salicylate of soda had no effect whatever, either on the temperature or joints. The right wrist was aspirated and ½ oz. of fluid removed.

Very careful cytological examinations were made in order to detect tubercle bacilli, but none could be demonstrated. I injected the fluid into a guinea-pig, and also into a rabbit. The guinea-pig developed tuberculosis in four weeks, and showed a progressive tuberculosis extending to all the organs. Cultures were made from the spleen of the guinea-pig on Dorset's egg medium, and a growth corresponding to bovine tuberculosis obtained. The rabbit also developed a tuberculosis, although of not so progressive and severe type as the guinea-pig, and similar cultures were made from the spleen and liver of the rabbit. These cultures also showed the bovine characteristics.

An emulsion was made from the contents of one of the tuberculous neck glands, and injected into a guinea-pig and also into a rabbit. Both animals developed in seven weeks a generalized tuberculosis, and cultures made from their organs were typically bovine in appearance. The stained tubercle bacilli showed nothing of a distinctive character. It was clear that we were dealing with a primary infection of the neck glands with the bovine bacillus, probably conveyed through milk and absorbed from the tonsils and pharynx. The secondary arthritic infection was evidently through the blood-stream. The von Pirquet reaction was most violent. There was no affection of the lungs or pleuræ.

Six weeks after the onset of joint symptoms the skin of the legs and feet became red, swollen and brawny, and numerous bullæ appeared, which soon ruptured, discharging greenish pus. Some of these appeared on the arms. After healing a dark brown stain was left on the skin, which still remains. On the subsidence of the acute symptoms I commenced a course of tuberculin T.R. (human) in very small doses, to commence with 0·0001 mg. The injections were given weekly in increasing strengths to a maximum dose of 0·01 mg., and I am glad to say with most welcome result. The glands have subsided to half their previous size, whilst the joints have become smaller and more movable, although they are still stiff but painless. The local reaction of the tuberculin at the site of the injection is very marked and persists up to the present time. We can only hope that further progress will be made, as she is not yet by any means out of danger.

Examination of the fluid from the joints revealed an excess of lymphocytes, which is, of course, in favour of tuberculosis, as opposed to that of polymorphonuclear leucocytes, which occurs in true rheumatism.

I have only seen three cases of this rare condition. The first was in Washington, America, in 1908, and occurred in a boy, aged 14, who was suffering from tuberculous neck glands with secondary pseudo-rheumatism in both hands and wrists. His joint symptoms entirely passed off after the gland was removed and a course of tuberculin administered. The second case I saw in Berlin this year at the Rudolf Virchow Hospital, and occurred in a girl, aged 17, suffering from tuberculosis of the neck glands and lupus. The third case I have just described. It is of interest to note that these three cases were all secondary to a primary tuberculous focus in the neck glands, which is, in my opinion, almost always produced by the bovine bacillus, and I can find no record of tuberculous rheumatism occurring in the course of pulmonary tuberculosis, which is most frequently the result of infection by the human bacillus. It would seem, therefore, that the bovine bacillus is much more likely to find its way into joints, and also into the blood-stream, than the human bacillus, which is generally limited in its action to the lungs, larynx, and intestines.

Professor Dieulafoy[1] divides tubercular rheumatism into two divisions: (1) primary, and (2) secondary. He mentions a case of recovery from a primary infection, but does not record any case occurring in the course of, or preceding, pulmonary disease. Bentz, however, records two cases in which the initial lesions, Pott's disease and osteitis of the tibia, remained active, while the joint troubles disappeared without ending in definite articular tuberculosis.

I will keep my patient under observation, and perhaps I may have the opportunity at a later stage of reporting her condition to this Society.

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[1] Dieulafoy, "Text-book of Medicine," 1912, ii, p. 1933.

Medical Section.

January 27, 1914.

Dr. SAMUEL WEST, President of the Section, in the Chair.

Discussion on Vaccines from the Standpoint of the Physician.

Opened by THOMAS J. HORDER, M.D.

I FULLY endorse the opinion of the Council of this Section that the time has arrived when the subject of vaccine therapy may be usefully discussed by its members. It is natural that conclusions drawn from the experiences of the physician should be arrived at more slowly than conclusions drawn from the laboratory researches of the bacteriologist. Without being invidious, I think these slower conclusions are likely to be more sure. I will venture to say that as the physician is more free from theories, provided he is also free from prejudice, he is the better judge of practical results. The physician is face to face with the patient throughout the treatment of his disease; he is the direct witness of the struggle and of the issue. Surely the final verdict must be his? If this is true it is, then, equally true that to occupy this high judicial position in respect of so important a matter as we are to-day discussing implies a responsibility none the less high. It behoves us to throw away all bias and to exercise our best judgment after a thorough trial of the matter under consideration. As I said, I think the physician has now had time to test the new therapeutic agent and should be able to speak with some degree of assurance of his results. He is no longer hustled by those who at one time accused him of gross neglect, as though he were deliberately refusing to his patient the benefit of a remedy of proved usefulness; nor is he to-day ridiculed by others who pointed to him as the one stumbling-block in the real advance of scientific medicine. These and other similar errors of judgment have now even less than a historic interest in the growth of specific therapy. That sudden intrusion of the skilled bacteriologist into the sphere of clinical medicine was a sight as pathetic as would be the invasion of the bacteriological laboratory by the physician. The difficulty was only a temporary one, and has been settled in the only way that was ever possible in the patient's interests — by a frank co-operation between the laboratory and the clinique. This partnership yields results that bid fair to stamp it as the final and satisfactory solution of the problem.

Recent Growth of Vaccine Therapy.

Freed from the incubus under which it first laboured—the hypothesis of the opsonic index—there has been an immense increase in the amount of vaccine therapy undertaken during the past five years. It is uncertain if we may conclude anything from this change in medical opinion in favour of the new remedy. At first sight the growing popularity of inoculation treatment amongst practitioners suggests that its utility is thereby demonstrated. But on a further view we become aware of the fact that to a large extent this accession of practical interest on the part of the doctor is due to the forcing of his hand by the patient. This, and a natural desire not to be left behind, may be responsible for much of the increase in the bulk of vaccine therapy as seen to-day, rather than honest conviction based upon personal experience. Just as hundreds of us joined the vogue for soured milk in the treatment of intestinal dyspepsia a few years back, and hundreds of us join the vogue for treating constipation by paraffin to-day, for reasons of necessity rather than conviction; so many of us inoculate our patients because it is expected of us, rather than because we feel it is the best way to cure them. In short, inoculation treatment is fashionable—it has "caught on" with the public—and it does not yet appear what the permanent place of the therapeutic measure will be. It must be confessed that a large amount of vaccine therapy is of the most discursive and slipshod kind; so desultory and unsystematized is it that it must be wholly excluded from any analysis made for purposes of assessing the results of the method in treatment.

Three Grades of the Remedy.

It was inevitable that the growing demand for vaccines at a price which put them within the reach of patients whose means could not permit accurate bacteriological diagnosis and the preparation of an autogenous vaccine would lead to the supply of "stock vaccines." And in the course of time it was manifestly desirable that the stock vaccines should be prepared with a view to their being "polyvalent"—i.e., that they should be made from a mixture of strains of the particular micro-organism concerned. In addition to the legitimate sphere created for such preparations by the patient's status, there is an actual necessity for them in certain cases of infection in which no material is available for the purpose of autogenous vaccine, but in which experience makes the nature of the infection highly probable. Stock vaccines are also required for prophylactic purposes. The latest demand has been for the addition to the list of vaccines of substances of more questionable value, and chemists now supply stock preparations which are mixtures of the endotoxins of several different micro-organisms: we have arrived at "phylacogens." This is a frank submission to the fact that there are many medical men who feel that something should be injected into their patients, but that beyond this they are not prepared to go. To what degree this submission prostitutes the main principles of vaccine therapy, or whether, after all, the practice of using such substances may not be quite reasonable in the present state of medical training, is perhaps a fit subject for our discussion. The use of phylacogens clearly demonstrates one thing—that the fear of ill-effects from the introduction of microbic poisons into the system has to a large extent died out, both in the mind of the patient and of the doctor, and this must apply as well to the micro-organism which is, as well as to those that are not, causing the disease.

We note, therefore, that the evolution of vaccine therapy has led to the production of three grades in the particular instrument made in the bacteriological workshop: autogenous vaccines, stock vaccines, and "phylacogens." That these three grades correspond with three degrees of efficiency there is very little doubt, and in estimating the good effects of vaccine therapy it is obviously unfair to attach any importance to failures following the use of the third grade of preparation, which must be regarded as one of the gambles of science, the hit or miss of medical practice. Even the results of the stock vaccines should not be too closely regarded in judging this question. The merits of vaccine therapy as a curative measure rest almost entirely upon the results obtained by the use of the first grade of preparation—upon autogenous vaccines conscientiously prepared after a full investigation of materials obtained from the patient with scrupulous care.

Too much must not be Expected.

It is probably not too much to say that in a number of diseases of undoubtedly infective origin the limitations of the vaccine method as at present known have been reached and fully demonstrated. By no arrangement of dose or of interval that I have been able to devise has it been possible to free the urinary tract from *Bacillus coli* in old-standing cases of chronic infection by this micro-organism, nor the bronchial tract from its mixed and changing flora in chronic bronchitis. But against this should be set the fact—for I believe it to be a fact—that when all that is possible has been done in the way of non-specific measures in the treatment of these affections, the careful use of a systematic course of vaccines leads, in the majority of cases, to a definite further improvement in the general condition, and to a less extent in the local defect. No doubt the difficulty is largely one of drainage; in chronic colon bacillus infection of the urinary tract it is not often a simple cystitis with which we have to deal: vesical sacculi, the prostatic crypts, and the kidney pelvis afford continued refuge for bacilli; and in chronic infection of the bronchial tract there is often a diffuse dilatation of the tubes, if there is not actual bronchiectasis. Effective drainage is of greater fundamental importance in such diseases as these than the most ingeniously arranged course of vaccine therapy. Some time ago I outlined with considerable care a full programme of treatment in a tedious case of bronchiectasis, and the programme included a course of vaccines prepared against the dominant elements of the flora present in the sputa at the time. Three months later I saw the patient again and shared the pleasure he himself expressed at his improved condition. It was doubtless a salutary thing for my humility to know that, having been compelled to defer his treatment on account of a temporary change of residence, the only point he had observed in my programme, and that very religiously, was to adopt a certain posture I had shown him for half an hour each day during his morning cough.

Too much uniformity of results is often expected from vaccine treatment. The sceptic should remember the complexity of the causal factors in so many infective processes and the variations even in the natural course run by them. He should also remember the difficulties there are in ensuring the proper correlation of the vaccine used with the pathological condition under consideration. Finally, he should not be over hasty for results. Patience is necessary in order to determine the best mode of calling out the specific response. A bias against vaccines diminishes the physician's chances of success; he is apt to make one of two mistakes: either he proceeds with such unreasonable caution that there is no assurance at any time that he is dealing with more than subminimal doses, or he pursues a too rigid adherence to a particular scheme of dosage and of intervals which has been laid down as a tentative guide rather than as an inviolable law.

DIFFICULTY OF ASSESSING RESULTS.

The therapeutic argument is probably the most difficult with which we have to deal in connexion with all diseases. In connexion with infective processes it is perhaps more difficult than in any other condition, for two reasons. Most infective processes are capable of spontaneous recovery, and in the majority of them we are doing other things to assist recovery besides giving vaccines. Both of these facts are freely quoted as evidence against the utility of vaccine therapy. And it may be allowed that single instances of recovery after the employment of vaccines in any disease would count for nothing in the experience of any of us. It is only when we see repeated instances of benefit directly following the use of inoculation in cases which had previously remained stationary or had been losing ground that we realize the results are *propter* and not merely *post hoc.* When we have employed all the other measures that are available and the net result is, perhaps, some gain which the patient slowly dissipates, or perhaps no gain at all; and when we then add the specific stimulus of an appropriate vaccine, and witness a specific response that leads to further gain of a definitely progressive sort—it is then that we feel it is right to say that the progress is due to the vaccine. And when such a sequence is repeated again and again in our experience our conviction becomes confirmed and definitely established.

The failures of vaccine therapy are probably more numerous than its successes. I think this is probably true, even if we discard as worthless for analytical purposes a list of instances in which the diagnosis or the bacteriological technique, or both, were faulty. Yet this fact does not of itself prevent my saying that I think we have in vaccine therapy a weapon of enormous value in the war we wage upon the causes of infective diseases. I am confident that the seeing eye can detect quite clearly, here and there, innumerable instances in which the patient has made a specific response to his inoculations, and has thereby been cured of his infection. It is as though one wandered up and down a long passage into which many locked doors opened, carrying a key and trying the doors with it. Many refuse to open: the key does not fit. Then there comes one where the key turns smoothly and the door opens easily. This accurate fitting of lock and key illustrates the specific stimulus and response of a vaccine given in a successful case. The question we are discussing is, primarily, does any key fit any door? A secondary question will be, how frequently are we able to find the proper key? I have no doubt myself as to the efficacy at times of vaccine therapy. I am as disappointed with results in the mass as most others are. But the primary question is of much greater importance than the secondary, because it involves a principle. The secondary question may be answered more satisfactorily as time proceeds and newer methods are introduced. With all the activity shown in vaccines during the past ten years it must be remembered that a great deal of it, as already remarked, has been too crude to serve as a basis for comment.

Factors counting for Success.

In exchange for a frank admission that I consider vaccine therapy a most valuable addition to the physician's powers, I may perhaps be allowed to say that I think this value is in direct proportion to the care and judgment bestowed upon the diagnostic problem. Every therapeutic measure is able to earn an evil reputation if it and the disease process are ill adjusted. This is no more the fault of the remedy than is an evil reputation earned by the same measure because a fanatic regards it as a panacea when in reality it has only a limited application. If, then, I recount the factors which I regard as leading to success in vaccine therapy I shall speak first of:—

(1) *Choice of Case.*—In the matter of the nature of the micro-organism concerned in the disease I have little to say. I think experience shows that the nature of the microbe matters little compared with the nature of the disease process. But even here, though the results in different processes differ widely, I am prepared to give vaccine therapy a trial, and I expect to get some degree of result, whether the process is chronic or acute, localized or general. What *does* matter is that the process shall be one of proved infection. To isolate a micro-organism from some part of a patient's body and to assume that his disease is therefore due to its activities is only the baldest of surmises. This, in the sphere of diagnosis, is the analogue of "phylacogen" in the sphere of treatment. The microbe found may

or may not be pathogenic to the patient, and one or other of the vaccines in the mixture used may or may not be specific for the infecting microbe. The diagnostic argument must be much fuller than this; considerations of pathogenicity include the biochemical characters of the microbe, perhaps its effects when injected into animals, tests to determine its reactions with the patient's blood, some quantitative estimate in regard to it, evidence of pathological changes at the site of discovery, and the constancy with which it is present in the patient and in controls. All of these criteria cannot, of course, often be obtained, but some of them are always forthcoming if care be exercised in the various methods that are at the joint disposal of physician and bacteriologist. Any considerable degree of knowledge as to which micro-organisms most commonly occur as causes of particular infections can only be gained by experience, and here again the single experience either of bedside or of laboratory is apt to mislead. It is not uncommon to see the most laudable methods wasted and the most reasonable hopes abandoned because the physician does not know that the vaccine he is using is prepared from a microbe which is incapable of producing the lesions of the disease under treatment. Freer discussion with the bacteriologist would perhaps have saved all concerned from disappointment. It is not too much to say that one can sometimes forecast failure for the very reason that the nature of the vaccine used so lacks conviction in its relationship to the disease process.

(2) *Isolation of the Causal Microbe.*—To the proper collection of infected material too much importance cannot be attached. It behoves the physician to acquaint himself thoroughly with the methods of doing this. It is of sufficient importance to do it himself and not to relegate it to the patient or even to the nurse. There is a feeling abroad that, provided certain precautions in the collection of material are given, the actual procedure cannot go wrong. This is a fallacy which leads to many errors and increases difficulties that are quite sufficient already. In the case of the urine in a woman, to name a common example, it is not enough that the specimen should be obtained by catheter and allowed to run directly into a sterilized flask; the catheter must be passed with more aseptic precautions than even a trained nurse can be expected to possess. Indeed, a bacteriological training is the only thing that ever teaches any of us properly the ubiquity of micro-organisms, whether we are physicians or surgeons or nurses. The material collected must come from the actual lesion under investigation and not from surrounding parts, where often secondary

infections, relatively unimportant, are present. The material collected, again, must be dealt with as promptly as circumstances allow, and the warmer the temperature at the time the more important this is. Many of the failures of vaccine therapy are failures in eliminating contaminations rather than failures in real trials of the method.

(3) *The preparation of the vaccine* scarcely falls within the scope of this discussion, and I doubt if it matters much whether the material is prepared by heat or by autolysis or by the use of antiseptics. Of *sensitized vaccines*, however, I should like to say that I am quite convinced of their superiority to ordinary vaccines in the treatment of acute and of generalized streptococcal infections, having seen them successful when the older method has failed of a result. In the use of *live vaccine* I have had no experience.

(4) *The question of dosage and of interval* is very important, although our knowledge is probably at present quite inexact as to both of these factors. We are guided by tradition and personal experience. The range of effective dosage without producing untoward results is probably quite considerable in man, as I was able by experiment to demonstrate is the case in animals. It must be so, seeing that different workers give doses of the same vaccine in widely varying sizes and report equally good or equally negative results. Of the various systems of dosage the graduated system seems to have proved the favourite, beginning with a (presumably) subminimal dose and increasing to a dose beyond which it is thought or found that ill-effects follow. This is the method I have found most generally useful in chronic infections (fig. 1). In chronic infections that tend to recur—e.g., furunculosis —I prefer to graduate the dose in the reverse order also (fig. 2). In acute infections my experience favours a steppage system of dosage (fig. 3), giving three doses of increasing size at short intervals, followed by a pause, the second series beginning with the intermediate or final size used at the first series, and so on. I think this serial dosage is also the most useful in employing sensitized vaccine in acute affections. As

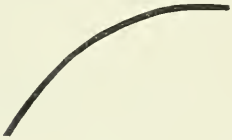

FIG. 1.

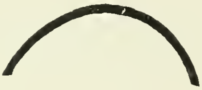

FIG. 2.

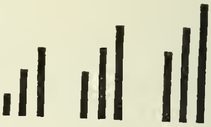

FIG. 3.

regards the intervals between the doses, I usually allow the traditional seven to ten days in chronic cases, and twenty-four to forty-eight hours in acute cases, with pauses that are determined by the course of the disease and by the apparent effects produced.

(5) *Cautions to be observed* include relative rest of the patient and of the affected part for at least twenty-four hours after the inoculation, and the omission altogether, or the reduction in size, of any dose that is due if the patient suffers undue fatigue, a chill, a menstrual period, undertakes a long journey, or has an exacerbation of the condition for which treatment is being given. It is very doubtful if time is ever saved by hurrying; it is certain that time is often lost by it. I feel convinced that I have several times seen patients rendered hypersensitive to a vaccine by unwise persistence, and requiring lengthy intervals before even small doses could be resumed.

(6) *Attention must be paid to all the non-specific points in treatment* just as though the patient were not having vaccine treatment to supplement them. The general condition of the patient is a factor of great importance in getting the best effect from a vaccine; for this reason no therapeutic measure bearing on the state of the blood, nervous system, and general nutrition should be neglected. The response to a vaccine is a specific response, which we are unable by any other known stimulus to produce. All the same, this specific response is more likely to ensue, and ensue more effectively, if the patient's tone is good than if it is bad. Our object is not to see from what depths we can raise the patient by the miracle of a specific stimulus, but rather to supplement those general measures that have already raised him to a certain level, at which he now remains, until the extra leverage of the vaccine completes the process.

ON CERTAIN PROBLEMS THAT REMAIN.

I have referred to the fact that certain *limitations* are demonstrable in the use of vaccines as prepared and administered according to our present knowledge. These limitations have already got far beyond anything that the sponsors of the method foresaw at its birth. No doubt we shall hear of several in the course of this discussion.

There are other problems that call for consideration. There is the problem of *recurrences*. Ofttimes a first result of vaccine therapy is good, may even be brilliant, but cannot be relied upon a second time or, if obtained then, fails at the third trial, even though the method is repeated exactly and the bacteriological diagnosis is carefully revised. What happens here? Is it nothing more than we see in a good many diseases treated on non-specific lines—as in phthisis, for example, where the first chance is a good one, the second doubtful, and the third rarely worth having at all? If so, the problem is not a new one. But the question arises whether we have in some way exhausted the patient's available response to specific stimulation by this particular method.

Then there is the problem of the *generalized infections*, and especially of *malignant endocarditis*, in which, as yet, the results of vaccine therapy, including sensitized vaccines, give us such sparse results. Occasionally in streptococcal septicæmia a few doses of sensitized cocci produce a result which is little short of magical, and now and again a pneumococcal case, similarly treated, gives almost as brilliant a result. But for the most part these cases do not yield; for some reason unknown to us the key does not fit the lock.

There is also the problem of *typhoid fever*, in which, though assistance is undoubtedly rendered in very severe cases by vaccine, the course of an ordinary case is not, according to my experience, shortened or modified.

Dr. J. Charlton Briscoe: I have employed the method of treatment by vaccines since it was first introduced, and am satisfied that much benefit may be derived from its use, but that it should not be employed promiscuously, and is certainly not an infallible remedy for all those diseases for which it was claimed to be a cure. Failures to cure certainly occur which are not at present capable of explanation. But I think that lack of success may to a large extent be explained by the want of even a rudimentary knowledge of the practical application of bacteriology to disease, and to the fact that many clinicians do not keep in touch with patients for whom a vaccine has been ordered. It is obviously futile to order a vaccine to be prepared from the "intestinal tract" for a case diagnosed as myocarditis, on which point I was recently consulted, or to say that the only, or even the correct, treatment for lumbago is a vaccine prepared from an organism grown from the pharynx. It is also misleading to declare that a vaccine has failed to produce any good effect, when it is eventually shown that a patient was all along suffering from cancer of the stomach. Further comment does not seem necessary.

At the outset I should like to mention briefly three cases, which give some idea of the effects which may be obtained, and the limitations of the use of vaccines in different conditions.

The first was a nurse, under the care of a surgeon who referred her to me, because she had an ulcer on the hand, due to a staphylococcal infection which had not yielded to ordinary surgical measures. There was also a small gland in the axilla. After the first injection of an autogenous vaccine the ulcer, which was about the size of a penny, healed quickly in three days, but the gland increased in size and pus had to be evacuated.

The second case is that of a lady who had chronic asthma, for which she had been treated by all the recognized climatic and therapeutic methods, and finally by cauterization of the septum. She was sent to me, because the ulcer produced by the cauterization had lasted for some months and would not yield to local applications. She only complained of a slight running from the nose and an unpleasant smell, but objected to her pet dog being attracted by the smell to this part of her body and insisting on licking her nose. I grew a pure staphylococcus from the base of the ulcer, and a vaccine of the organism produced temporary healing of the ulcer and stopped the smell; but the most marked effect of the vaccine was the improvement in the asthmatical attacks.

The third case was that of a doctor's wife with severe rheumatoid arthritis, who had had all her teeth removed prior to my seeing her. This treatment led to temporary improvement followed by a relapse. When I saw her, her gums were so tender that she could not wear a plate, and small nodules of bone were found projecting under the surface of the gum. A dentist removed one of these nodules, from which I at once made a culture, and a streptococcus was obtained. Since the employment of a vaccine of this organism her gums have completely recovered; she can wear her denture, eat in comfort, and the arthritis has disappeared, so that she can play the piano, golf, and generally enjoy life.

These cases illustrate important points in vaccine treatment:—

(1) The treatment tends to the production of pus in large or microscopic quantities, according to the size of the focus, so that the best effects will be obtained where drainage is present. This is especially true where the organism belongs to the category of the active pyogenic organisms.

(2) The vaccine may stop toxic symptoms, as in the case of the patient with asthma, while not producing permanent disappearance of the original local conditions.

(3) If the individual lesions are very small the necrotic material will be absorbed, but in every case drainage is desirable.

I would further illustrate these points by noting some other experiences which have occurred to me. I was possibly responsible for the production of an empyema in the thorax, by employing a vaccine in two cases where pleural effusion was present. I have also seen a case of empyema of the antrum of Highmore following the employment of a vaccine which was given to clear up a collection of serum which recurred in that cavity. The only occasion on which pus was formed in the antrum was that in which the vaccine had been employed. On the other hand, I have at present a case of suppuration in one of the deep sinuses of the head, where, after several operations, good drainage cannot be obtained. In this case an autogenous pneumococcus vaccine prevents the recurrence of severe headaches and other toxic symptoms, but there is a copious discharge of muco-pus every three or four days. Vaccines seem to be the only treatment in this patient, as operation and drugs have both proved ineffectual. I should, however, be very chary of using a vaccine in any case of a comparatively large lesion where free drainage is not obtainable. When pus has been evacuated, vaccines will hasten the closing of the sinus and cut short the suppuration in a marvellous way, as, for instance, the suppuration following the drainage of a pneumococcal peritonitis. If, however, in any suppurative condition a sinus has been present for some weeks and is thick-walled, this effect is not produced, probably on account of mechanical factors preventing collapse of the walls; but even in such cases it is quite remarkable how the discharge becomes more serous in character.

Returning to the second consideration, that of the relief of toxic symptoms, which result from an infection, we have to deal with several different conditions. Asthma is frequently due to the presence of some infection, which may be localized in the lungs or some other part of the body. Where possible, such a focus ought to be removed—e.g., nasal polypi, septic tonsils, &c.—when the spasmodic conditions will be rapidly relieved. If, however, the condition is associated with the presence of an infection in the lung alone, as may be shown by expectoration of sputum containing organisms during an attack, a vaccine prepared from the infecting organism will in most cases diminish the severity and frequency of the attacks. An infection may occasionally be got rid of completely, but as a rule the attacks tend to recur in a milder form, at longer intervals, and at such times as the infection recrudesces. I have several times grown streptococci or pneumococci from the centre of a Curschmann's spiral, and employed a vaccine from this source with success. I do not wish to convey the impression that every case of asthma will yield to this treatment. One of my patients, who was treated without success, was an alcoholic, another could not get sufficient food to eat, and in a third case I could find no reason for the failure. This third patient gets no attacks when taking arsenic and iodide, but if a single dose is missed the attacks supervene. It must not be overlooked that an inoculation may be followed by a very severe asthmatical attack, and in one of my cases a patient was prostrated for thirty-six hours, but then recovered, and has been free from attacks during the last three years. I think such symptoms are produced by an excessive dose.

Bacilluria and rheumatoid arthritis are diseases which ought to be placed in the group in which relief of toxic symptoms may be obtained. The former, if established for any length of time, is extremely difficult to eradicate, but fortunately often causes no symptoms. If, however, frequency of micturition with smarting, headaches, and other general symptoms occur, which are not relieved by drugs, a vaccine will produce temporary relief. An injection given at intervals of four or five weeks will keep these symptoms in abeyance, and from the patient's point of view is infinitely preferable to daily lavage of the bladder. Before making a diagnosis, and to obtain the culture, I need hardly say that a catheter specimen in a sterile vessel must be obtained. I mention this because I have seen a patient with a tuberculous bladder treated for some time by a *Bacillus coli* vaccine obtained by culture from a non-catheter specimen, with no relief. With the catheter specimen *Bacillus coli* could not be grown, though urine collected in the ordinary way contained many, and the diagnosis of tuberculosis was confirmed by animal experiments.

Rheumatoid arthritis is also a condition in which a focus of infection is frequently to be found, and removal of the local infection is followed by ultimate relief of symptoms, thus indicating the toxic origin of the disease. In this affection, as in all other conditions, the focus of disease should, if possible, be removed. If it cannot be completely removed, vaccines will often assist the surgical treatment, when employed either for a short time before, or for a long time afterwards. I can quite appreciate the patient preferring a vaccine to an operation—for instance, extraction of the teeth—but in my experience, in chronic cases where the focus has not been removed relapses occur shortly after the vaccine is discontinued. By following this line of treatment I have had a considerable number of successes in this disease.

I will now mention a few cases where other treatment has not done good, in which vaccines have done so.

The first case is that of a girl, aged 12, with a cellulitis of the scalp, who had had a temperature ranging from 99° to 104° F. for several weeks. All the lesions disappeared within three days of the injection of a staphylococcus vaccine, which I made from the pus. Two inoculations of fifty million were given at twenty-four hours' interval. The second was followed by a severe collapse. This may have been due to the vaccine or to an enema which had been given about five hours previously. She had had a similar attack following an enema a week earlier. In another case of this type an autogenous vaccine did not have any good effect.

The second case is one of acute *Bacillus coli* infection of the genito-urinary tract, with great pain in the right loin, a tender kidney, pain over the bladder, pyuria, and a temperature of 103° F. Within twelve hours of the injection the pain was much relieved, and the temperature fell to 100° F., but rose again to 102·5° F. in the next twelve hours. A second injection at this stage brought the temperature to 99° F. The temperature did not rise again, and the acute pain disappeared. Prior to the use of the vaccine local and general treatment had led to little improvement. Other cases of this condition have reacted in a similarly favourable manner. In this type of case a vaccine does what no other treatment I have seen can do. In these acute cases the dose should always be small—about half a million—and not increased, or collapse symptoms may follow, and I think a too large dose accounts for what ill-effects have been observed.

The third case is one of a woman with a large caseous mass in the pelvis, from whom the uterus, part of the bladder, and a coil of the intestines were removed, on the supposition that the disease was tuberculous. Microscopic investigations showed that the infection was due to *Bacillus coli*, all the caseous mass was not removed, and she had cystitis. I treated her with a vaccine for fifteen months, at the end of which time no signs of disease could be detected on abdominal or pelvic examination. She had gained more than a stone in weight, and has had no recurrence of caseation or cystitis. This type of chronic coli infection does not seem to form pus, but produces caseation, and I have met with several cases diagnosed as caseous tuberculous peritonitis, which were not due to tubercle, but to *Bacillus coli*. Vaccination assists these cases to a considerable degree.

A fourth case is that of a nurse, who was suffering from an acute pyrexial polyarthritis of five weeks' duration. The urine was cloudy, owing to the presence of streptococci; general treatment was without effect, and the use of a vaccine of this organism was followed by cessation of pain and swelling of the joints and of the temperature in the course of three days, and the organism disappeared from the urine in a month. There has been no relapse; she, however, remained anæmic for eighteen months, but is now well.

The results of this treatment in pulmonary conditions after pneumonia, bronchitis, &c., are very satisfactory. I shall only mention one case, that of a lady who had bronchorrhœa of a distressing character, with so much cough and wasting as to be a complete invalid. The condition had persisted since 1878. In 1909 a vaccine of influenza bacillus and pneumococcus was obtained from culture of the sputum. Injections of this had reduced the sputum to practically *nil*, she only coughs and expectorates three or four times each morning, has gained more than 14 lb. in weight, and can attend to her household and walk five or six miles in a day. If she goes without an injection for five weeks the cough and expectoration return, and she feels ill. I am bound to say I did not at the time think that vaccines would be of any service. She had tried all manner of treatment with no favourable result, and was considered hopeless. This is only one of many cases of this type, which react in an extraordinarily favourable manner.

I have had no successes in cases of septic endocarditis, or in any case where there is not a localized source of the infection.

My opinion, founded on my own personal experience, is that vaccines are valuable in reducing symptoms and causing the disappearance of infections in some acute and chronic cases, but not in all. The present state of our knowledge of this form of therapy, and its practical application, is obviously incomplete; we can neither account for our failures nor predict success. There is still a great deal to learn as to suitable and unsuitable cases, and as to why a vaccine succeeds in one case and not in another apparently similar, as, for instance, an attack of boils.

Finally, I should like to emphasize the following points:—

(*a*) Vaccines are to be employed as an additional therapeutic agent, and not as a substitute for established methods.

(*b*) Where a disease is attributed to a focus of infection, such focus should, if possible, be eradicated, or where this is not possible it should be treated by recognized procedure, and, if necessary, by the addition of a vaccine.

(*c*) In many cases vaccines relieve symptoms temporarily without curing the disease. The focus remains, and relapses ensue.

(*d*) In acute cases very small doses should be used, and in chronic cases increasing doses of the vaccine should be employed.

(*e*) I have never seen a case where permanent harm was produced, or where the lesion has become permanently worse, except where an infection existed in a closed cavity.

Dr. Phineas Abraham: I should like to offer my humble protest, late though it may be, against the use of the term "vaccines" for these preparations or emulsions of killed micro-organisms. It is not only obviously inaccurate, but it seems to me to be positively misleading. An enormous majority of our profession, and of the educated public in general, is rightly convinced of the efficacy of Jennerian vaccination, in which a real or true vaccine is employed: and it is quite possible that thoughtless people may be led to look upon these modern so-called "vaccines" as in the same category, and in consequence extend to them their faith, and in all cases recommend their use. Why not call the new method of treatment after the distinguished investigator who has introduced these injections and made them so popular—e.g., the "Almroth Wright Treatment," or perhaps, as Professor Koch was, I believe, the first to inject a bacillary preparation (tuberculin), the "Koch-Wright Treatment"? At any rate, I am sorry to say that in my perhaps unfortunate experience it has certainly not been a "cock-sure" method of treatment! I have tried it in several generalized diseases of the skin, bullous affections, desquamative dermatitis, eczema, &c., with little or no benefit; in one case, indeed, the patient's death was accelerated, I fear, by the treatment. I have also seen the results of these injections, at the hands of others, in quite a large number of cases of localized staphylococcic infections and of common acne. These patients have come to me after a course of the new treatment which had proved futile and sometimes even disastrous in its results.

It may be objected that these cases had not had the treatment properly carried out, that the operators were not experts, that the preparations had been obtained from a manufacturing chemist, and not autogenously prepared by skilled pathologists; but these objections will not obtain. Many of the bad results that I have seen have been in patients who had been under the care of thoroughly competent medical men, even of men who had learnt their work at St. Mary's Hospital, and at least one of the cases which had been made worse by the treatment had been a patient of Sir Almroth Wright himself! From what I have read, however, and from what I have seen in the practice of others, I am ready to admit that this treatment is not always so unsuccessful in its results, nor will I deny that some cases of cutaneous diseases have been cured by its means; but I do maintain that in the vast majority of acne and furunculosis cases a more rapid and certain cure can be effected by well-known common-sense measures, without any risk of generalizing the pustules and producing such results as I have seen.

The younger generation of practitioners and our growing class of "laboratory physicians" who may now in every case of simple acne or boils fly at once to bacillary injections, are possibly not aware that for years and years medical men of experience have been accustomed to cure most of such cases with comparative ease by simple antiseptic, surgical, and rational medical means. I believe that some enthusiasts are actually using courses of staphylococcic injections for common contagious impetigo—forgetting, I suppose, that this can be cured in a comparatively few days by white precipitate ointment. I think this reaches the limit!

In my humble opinion, we are quite justified in employing these new, experimental, and possibly risky methods in severe cases when ordinary measures fail, but not in cases amenable to well-tried and safer treatment, such as those to which I have alluded. I know that the so-called "vaccine therapy" is at present "in fashion," particularly for acne and for furunculosis, and that anyone who does not practise it is apt to be regarded as a retrograde "fossil" and not "up to date." However that may be, I for one will certainly not adopt it as a general treatment in these diseases, until it can be shown to be more successful and less likely to cause unpleasant results than the older measures which, on the whole, I still find quite satisfactory.

Dr. H. T. GILLETT: The subject under discussion to-day is, I understand, to be limited to the effects of treatment, successful or otherwise. Success in treatment naturally depends partly on using an efficient vaccine, but also quite as much, I think, on the method of administering the doses. I cannot from my own experience say much as to the value of stock vaccines, for I have only used them in cases of boils, acne, and nasal catarrh, in the last of which I have not had much success. I have used autogenous vaccines almost entirely, and the media used in cultivation has generally been blood-agar, nasgar and blood broth, on the supposition that the micro-organisms grown on these media will more closely resemble in composition their antecedents in the tissues of the patient, if they are fed either on blood or ascitic fluid.

I have followed the usual method in dosage—namely, to begin treatment with a dose small enough to do no harm and gradually to work up to a reacting dose, allowing sufficient interval for recovery from any negative phase before giving another dose. I have tried the intensive method of Fornet and Müller in two cases but have been disappointed in it. The first case was one of leucorrhœa of fifteen years' standing which had been treated by douches, curetting, &c.; the first course of vaccine given once a month before the period and by the intensive method failed to cure, but a later course given at intervals of about a week in very gradually increased doses was successful in arresting it. The second case treated by the intensive method was one of chronic bronchitis, and after three increasing doses on consecutive days the patient went to bed with an acute attack of bronchitis. I am naturally shy, therefore, of the intensive method. An incident illustrating the effect of an excessive dose happened to a friend of mine; he had nearly cured a patient who had suffered with chronic bronchitis when the patient went away for a change. He was then given by another doctor double the previous dose and he went to bed with an acute attack of bronchitis and a temperature of 103° F. Even after this experience he was willing to try vaccines again, and my friend told me the other day that he was very nearly cured.

I have found that cases of chronic bronchitis generally respond very favourably to treatment by vaccines; perhaps 25 per cent. will fail to respond or will recur. Where a dyspnœa is associated with it, I have seen very great benefit follow this method of treatment. I shall never forget two of my early cases where there was much dyspnœa associated with the bronchitis. One of them had been ill on and off for a year and a half and the nights were much broken, but after the fourth injection the breathing was a good deal easier, the sleep was better, and the patient was able to lie down in bed. After three months' treatment the cure was completed and there has been no recurrence during the last two years. The other case was one of seventeen years' standing, with dyspnœa at night, who was cured in about two months after four inoculations. Some of the very chronic cases seem to improve a little and then either stand still or may relapse at intervals. I have endeavoured in vain to cure a case of twenty-five years' standing. During the last few years this patient has also had attacks of pneumonia recurring about every five months. The only benefit from the vaccine treatment that I have been able to see is that the last two attacks have been of shorter duration.

In subacute cases of bronchitis I have found this method of treatment of much use both in clearing up the trouble and allaying an irritable cough.

I have only recently begun to treat cases of rheumatoid arthritis by inoculation and have only completed one case. This lady had a good deal of fluid in both elbow-joints, so that the arms could not be fully extended; the right wrist was swollen and painful, and the ankles and knees were stiff and swollen. She could get about with a stick, but could not get farther than across the street, and that with difficulty. The teeth had been removed some years. The synovial fluid from the elbow-joint was sterile; a blood culture was sterile; but from the urine I grew a pure growth of a coliform bacillus and made up a vaccine. I was not very hopeful myself but thought it was worth a trial. After the third injection the pain was much easier, and instead of remaining awake at night, for an hour or two she was able to get off to sleep almost at once. At the end of two months' treatment she had no pain, she could walk three miles without the help of a stick, and gained 5½ lb. in weight in four months. At the end of treatment a single examination of the urine proved sterile. I am far from believing that all cases of rheumatoid arthritis are caused by micro-organisms, but from recent publications in the medical journals I think it is becoming clearer that a certain number of them at any rate are directly caused by the toxins of bacteria.

In acute cases—e.g., pneumonia and septicæmia—very favourable reports of treatment by sensitized vaccines have been published. I have only used them in a few cases, but have been favourably impressed, and it seems to me that they should be particularly useful where the patient's powers of resistance are low and where a negative phase might be dangerous. One of these cases was a septicæmia. Streptococci were grown from both sputum and blood and a vaccine prepared from the latter was sensitized with serum from the Pasteur Institute. During the first ten days of the illness the temperature was remittent and ranged from 100° to 105° F.; there was a recent systolic murmur at the apex of the heart. By the end of the first week the tongue became dry and brown and the facies dull and heavy, with slight cyanosis. Inoculation treatment was begun on the tenth day, when the temperature was 105° F. Daily injections were given beginning with 10 million and increasing to 50 million in five days. No negative phase could be observed clinically; the temperature fell steadily every day and reached normal on the seventeenth day of the illness. Sleep and general comfort of the patient corresponded with the fall in temperature and convalescence was particularly rapid. The following is the report of Dr. Maude, who attended this case from the beginning: "The patient was most certainly going downhill day by day until the vaccine treatment began, when improvement began at once and progressed uniformly into convalescence." But in patients where the powers of resistance are not exhausted it seems more reasonable to use a vaccine without sensitization, on the supposition that a larger quantity of antibody is formed after the stimulus of the vaccine alone than is the case when immune body is injected at the same time. Pfeiffer and Friedberger have shown this to be so by experiments on animals.

I have treated cases of pneumonia without, as far as I could judge, any apparent benefit; but in other cases the injections appeared to have a very marked effect. One of these cases illustrates particularly the effect on the temperature: this had fallen to normal on the third day without any vaccine treatment, but rose again almost at once, and there was severe headache on the fourth and fifth days. A dose of 7½ millions of a pneumococcus vaccine made from the sputum was given on the fifth day. The headache was relieved within six hours and the temperature fell to subnormal next day and remained so for two days; then it went up again, and the next injection given five days after the first one had no apparent effect and I think was an insufficient dose, so the next dose was increased to 15 million, and the temperature fell to normal the same day, and remained normal after this. However, the patient developed iritis, which in spite of a general immunity (as judged by a normal temperature) did not improve till treatment with atropine and hydrarg. c̄ creta was adopted. I believe ophthalmologists as a rule do not believe in the value of vaccine therapy. Is it because the plasma does not freely bathe the tissues of the eye?

Another acute case which has impressed me with the value of the unsensitized vaccines was that of a child who had broncho-pneumonia; the physical signs were spreading, the temperature was remittent, ranging between 100° and 103° F., the pulse and respirations were increasing daily. A small amount of sputum was collected aseptically, from which was prepared a vaccine of streptococcus and pneumococcus and an injection of 15 million was given on the fourteenth day of the disease. During the following six to eight hours a negative phase followed, with increased cough, increased rapidity of pulse and respiration; but twelve hours after the injection the temperature began to fall and within twenty-four hours it was normal, and remained normal afterwards and the lungs cleared up quickly.

I must apologize for this somewhat sketchy account of a few of the cases I have treated, but time does not allow of more detail.

(The discussion was adjourned until February 3.)

Medical Section.

February 3, 1914.

Dr. SAMUEL WEST, President of the Section, in the Chair.

Discussion on Vaccines from the Standpoint of the Physician.[1]

DR. H. D. ROLLESTON: In resuming this discussion, it may be well to remember that its scope is confined to the effects of treatment by vaccines, good, bad or negative, and, further, that the subjects of prophylaxis and of tuberculin should as far as possible be avoided. In the opening speeches the two most striking statements were the frank admission that the failures of vaccine therapy were probably much more numerous than its successes, and that vaccines when employed should be in addition to, and not a substitute for, the ordinary methods of treatment. Dr. Phineas Abraham's suggestion that another word should be used in the place of "vaccine" is probably now too late, for the American substitute "bacterin" has not apparently made much headway.

Opinion on vaccine therapy may be divided into: (1) The optimistic, held by those who, while under the fascination of a new conception of a really rational treatment, have seen several cures in succession. This attitude is usually somewhat modified by time. (2) The pessimistic, more often expressed in private than in print, to the effect that vaccines never do any good, and that benefit apparently due to their use is either a coincidence or is, perhaps, due to suggestion. This destructive criticism demands some courage from those who hold it, for it lays them open to the retort that their bad results depend on faulty technique, insufficient experience or reluctance to give credit where credit is due. I therefore hope that Dr. H. Batty Shaw [4], who has so openly expressed his views, will not feel that as Secretary of the Section it is his duty to smother his own convictions. (3) The doubtful or open-minded. This is my own position. Curative vaccine treatment must be admitted to have disappointed the high hopes with which it began, and in this respect its history resembles that of most remedies. The problem of immunity is so complex that it is highly probable that the technique or practice, rather than the principle, of vaccine therapy is at fault, and that in time this may be so perfected as to establish the position of vaccines as a reliable remedy. The determination of the infecting micro-organism is exposed to well-known fallacies, and may be very difficult. Even with all due precautions, a wrong vaccine may be given and do harm; the blood of a woman suspected of infective endocarditis was sterile, but agglutinated *Micrococcus melitensis* and a vaccine was therefore given; her condition then rapidly deteriorated, and the necropsy, eighteen days after the vaccine was begun, revealed infective endocarditis with multiple abscesses in the kidneys. Possibly the conditions of culture on artificial media may so modify the products of the micro-organisms of which the vaccine is composed as to render artificial inoculation far inferior to auto-inoculation. It has, therefore, been suggested that vaccines should be made from organisms grown on blood or other natural media (Hort) [2]. There is an obvious analogy between vaccine and organo-therapy; the success of thyroid substitution treatment has been so irrefutable that it has stifled any doubts as to the rationale of the treatment, which might be raised by want of success with other glandular extracts. In Addison's disease, for instance, some link in the chain necessary to secure success in adrenal medication commonly fails to hold; and artificial organo-therapy, like artificial inoculation, shows itself a poor substitute for the normal process. The hypothesis of pluri-glandular insufficiency has brought forth an industry of pluri-glandular therapy, which is comparable to that of phylacogens.

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[1] Adjourned from January 27.

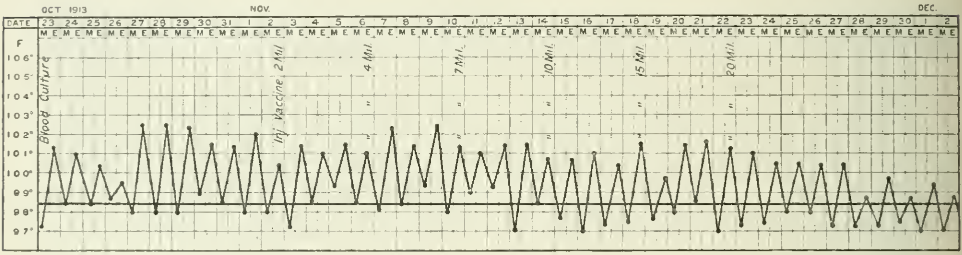

CHART I.

Further, there is no doubt that vaccine therapy has been used improperly in many ways; thus, it has been employed as a speculation—namely, in cases in which the nature of the infection is assumed, but not proved; for example, a stock pneumococcic vaccine is given to a patient, thought from symptoms and signs, but not shown bacteriologically, to have pneumococcic infection of the lungs. This attitude, which is quite foreign to its rationale, has damaged vaccine therapy, and has exerted an evil influence on medicine generally. The introduction of phylacogens recalls the happy-go-lucky polypharmacy of a bygone age. That bad results may follow injections of vaccines must be admitted. I have seen cases in which this sequence of events, and even grave illness, seemed beyond doubt. It may be due to administration of the wrong vaccine, to excessive dose of the appropriate vaccine, or to acquired hypersensitiveness on the part of the patient. Although it may sound paradoxical, the power of vaccines for evil may be regarded as, to some extent, an argument that they may in different circumstances be powerful for good.

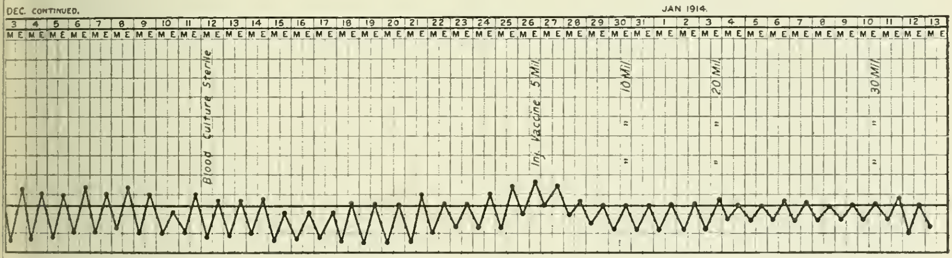

Chart I (*continued*).

At the present time the results of vaccines are so uncertain that their use appears to be justified only when trustworthy therapeutic methods have failed or do not exist. Few, if any, would be prepared to argue that the specific action of vaccines is as certain as that of such drugs as mercury, iodides, bromides, salicylates, digitalis and arsenic.

That good effects, sometimes dramatic in their intensity, may follow the use of vaccines is also undoubted. But the old question *post hoc propter hoc* arises. Difficult as it is to decide this problem in the absence of exact controls, it seems wiser to act as if the sequence of events was not a coincidence only, and, in cases in which nothing better is available, to give our patients the chance of benefit from vaccine treatment. In conclusion I will refer to cases of diseases usually resistant to vaccine therapy, in which cure followed this method of treatment. In the case of a woman with an old mitral lesion, an oscillating temperature appeared, and a blood culture by Dr. E. L. Hunt showed a micrococcus, differing both from the streptococci and pneumococci usually found in malignant endocarditis. The administration of a vaccine was gradually followed by a fall of temperature to the normal (Chart I). This case is mentioned because the usual experience is that vaccine therapy fails in infective endocarditis; thus Wynn [5], who was successful in other systemic infections, did not obtain any good results in fifteen cases of streptococcic endocarditis, and Horder [1] reported a similar experience in twelve cases. On the other hand, it is quite possible that the improvement in my case was independent of vaccine treatment, for Libman [3] has shown that bacteria-free periods and recovery may occur spontaneously in subacute bacterial endocarditis. In a case of acute pyelitis, due to *Bacillus coli*, in an infant, aged 2, injection of $\frac{1}{6}$ million of bacilli brought the temperature down at once

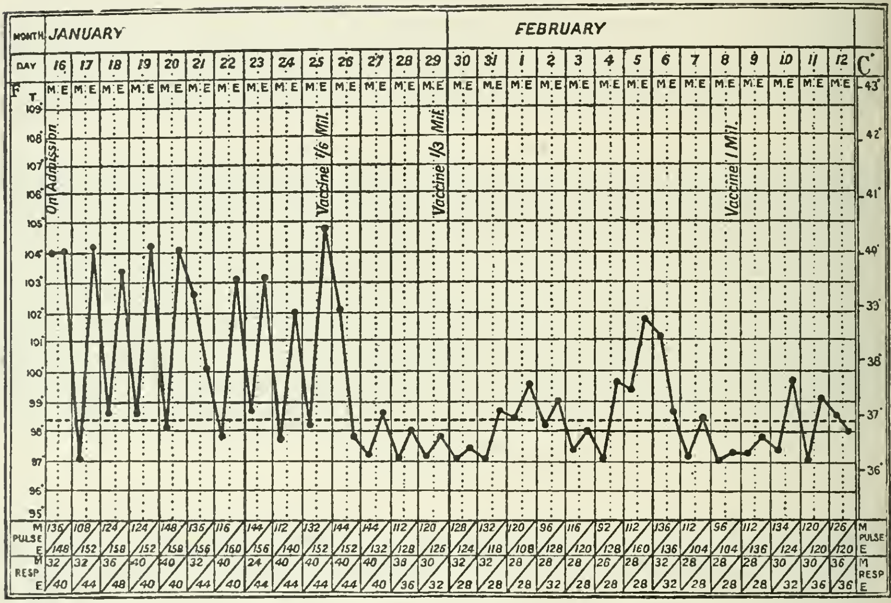

CHART II.

in a very striking manner (Chart II). This appears to be an unusual result, but I cannot help correlating it with the treatment. In chronic local infections of various kinds, such as arthritis and colitis, in which gradual improvement follows vaccine therapy, it is very hard to decide whether the credit is due to the treatment or to nature unassisted.

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[4] SHAW, H. BATTY. *Brit. Med. Journ.*, 1913, i, p. 921; *Med. Chron.*, Manchester, 1913, lviii, p. 185.

[5] WYNN. *Journ. Vaccine Therap.*, Lond., 1912, i, p. 253.

Dr. D. W. CARMALT-JONES: An immense proportion of all disease is due to bacterial infection, and we have no single drug or combination of drugs in the Pharmacopœia which has any direct effect on bacteria in the tissues. But patients do recover from bacterial infections, and since they do so without any very direct assistance it is clear that they have natural powers of resistance thereto. The labours of the biochemists and bacteriologists have shown that this power of recovery is due to the fact that the tissues can form antibodies to any foreign albuminous substance which is soluble in the tissue fluids. It may be late in the day to be labouring this point, but since it contains the whole principle upon which the use of vaccines depends, and since it has been in no way modified or in any practical way elaborated in the ten years or so during which vaccines have been in use, I venture to formulate it once again. Exponents of vaccine therapy, therefore, claim that they are guided by a definite principle—namely, that they are using a substance which can produce a certain physiological effect, which they use with considerably greater rational support than is possible with most drugs available for oral administration. No one with experience in vaccines claims that he can control infection in any given case, but most of us are at least confident that the principles upon which we work are sound ones, and that if the control of infections is ever possible it will arise out of the methods we employ to-day.

In using vaccines, we take the organisms which are the cause of any given infection. We kill them and inject them into a healthy site, where they may stimulate the tissues to produce the required antibodies. These principles indicate not only the scope but the limitations of the method. Organisms in any site do more or less destruction leading to scars, deformities, loss of function. Vaccines will do nothing for these conditions. As several previous speakers have indicated in one sense or another, it is essential that all sources of irritation, such as sequestra, pus or dead tissue, or foreign substance, be removed. This is the first indication for accessory treatment in cases under vaccine therapy and its omission is a common cause of failure. Even so, success is not to be looked for unless three further conditions are observed: (1) That the correct organisms be used for the vaccine; (2) that suitable doses be injected; and (3) that the patient's tissues are capable of responding. Errors enough are easily made with regard to the first two, but the last remains always an unknown quantity. In experiments on normal animals I believe fairly regular response can be obtained to definite injections according to the body weight, but a patient suffering from a bacterial infection is not a normal animal; one site among his tissues at any rate has failed to respond to the stimulus of the bacteria, and if other sites fail to respond to the vaccine I cannot see that that is very remarkable; in fact if the risk of this disability is borne in mind, it is not the failures but the successes of the treatment which excite surprise.

Before leaving the theoretical side of the question, I think some comment is desirable on an observation of Dr. Horder's. He remarks on the advantages to vaccine therapy "on being freed from the incubus of the opsonic index." If that very remarkable piece of constructive work is really all wasted labour, if it is not the case that it indicates the measure of a person's resistance to a given infection, then medicine is so much the poorer, and the fact is a matter rather for regret than satisfaction.

As for my personal experience of vaccine therapy, I ought to say that it is chiefly among out-patients, or patients who come to me for treatment, which is much the same thing from one point of view—namely, that of dose. Roughly speaking there are two schools of dosage, the large and the small, and since it is necessary to play for safety with patients who are passing out of one's sight, I am accustomed both by necessity and conviction to use small doses.

Among acute and severe diseases I have seen a case of malignant endocarditis with emboli, which began to mend with the use of a vaccine and ultimately recovered, but of the commoner septicæmias of known bacteriology, such as pneumonia and typhoid, which commonly end in recovery, a very much larger experience than mine is necessary before a convinced opinion can be formed, but I always advocate the use of vaccines on principle, and the results which those with large experience have obtained support this.

I should like to note some results obtained in pyorrhœa alveolaris, bronchial asthma and arthritis, as matters within the scope of physicians. Gingivitis and pyorrhœa are the common forms of oral sepsis, now rightly regarded as of much importance to general health. My own experience, both bacteriological and therapeutic, makes me regard it as primarily a streptococcal infection, to which accessory organisms may be added. I am satisfied that local improvement and improvement in general health and digestion, and in the incidence of obscure fascial and muscular pains, is frequently obtained by the use of streptococcal vaccines. I never attempt to treat such cases in private without the co-operation of a dentist, and they are cases in point of the necessity of removing foreign substances such as tartar, pus and dead teeth.

With regard to asthma, my experience is similar to that of Dr. Briscoe—namely, that good results often follow vaccine treatment. I collected at one time a considerable number of cases, about fifty, treated with one particular vaccine, which I thought had a specific value, and which I still use occasionally, but I now prefer the organisms from the patients' own sputum. Here is a record from a patient who has been under treatment for four months, and who has had severe nocturnal asthma for ten years: First month, sixteen attacks; second month, six attacks; third month, four attacks; fourth month, one attack. In successful cases the attacks are thus diminished in frequency and severity. The cause of asthma is obscure; I have always regarded it as reflex in character, and depending chiefly upon an irritable respiratory centre, which is excited to spasmodic action by impulses from many surfaces, such as the nose in the cases curable by nasal surgery; the intestinal tract in the cases in which attacks are precipitated by heavy meals; or an infected bronchial mucous membrane, and the cases of the latter are those which are amenable to vaccine therapy. The centre should not be forgotten: worry and overwork often precipitate attacks, and a full dose of bromide should be given when there is a liability to irritation from that source. In out-patient practice I have had several cases of this kind under observation for a period of years, some of whom now come up at intervals to report, and appear to be quite free. I find, however, that the treatment requires considerable patience on both sides; results are only obtained slowly; it is only in the fourth month that there has been any great improvement in the case I have quoted.

Cases of arthritis are either of known or unknown bacteriology: in the former category are the gonococcal, pneumococcal and typhoid cases, and in the latter the rheumatoid cases. Gonococcal arthritis, a sufficiently intractable condition by ordinary methods, has given fair results in my experience. I have recently had an out-patient under treatment for about three months, who came with swelling of one knee and considerable limitation of movement; the fluid is completely absorbed, and movement restored, though he is still subject to rheumatic pains and a sensation of weakness and insecurity. Rheumatoid arthritis is a disease of indeterminate bacteriology, and as such its treatment by vaccines is purely empirical. It is usual to say that it depends on a septic focus from which toxins are absorbed, which produce the joint and other lesions, and on this assumption much work has been done in the way of using vaccines of organisms derived from gums, urine and fæces, and sometimes good and even striking results are obtained. I have elsewhere reported a case of acute rheumatoid arthritis of fourteen weeks' duration, which began to improve immediately after treatment with a vaccine of streptococcus derived from the fæces, and recovered completely. Referring again to out-patients, I have under treatment many chronic cases of arthritis who are much deformed, and altogether beyond cure, but who continue to attend, because they find that, on the whole, their pains are rather better when they are under treatment than not.

On the whole, I am fairly well pleased with the results of vaccine treatment in these chronic cases. They are the victims of permanent damage, cure is in many cases impossible, but my experience has been, that when patients persist in treatment a good deal of relief is ultimately obtained.

Dr. Nathan Raw: *The Value of Vaccines in Pneumonia.*—It is my intention to-day to restrict my remarks in this great discussion on the value of vaccines in medical practice to the influence of autogenous or stock vaccines in the treatment of pneumonia and pneumococcal infections. I might say, at the outset, that it is extremely difficult, if not impossible, to estimate accurately the value of any particular treatment in pneumonia. In the first place, the type of pneumonia is constantly changing, and in different seasons the virulence of the pneumococcus varies enormously in intensity, so that at certain seasons most of the cases of pneumonia are simple and uncomplicated, running a normal course, and usually ending in recovery. At other seasons the majority of the cases are of a virulent type from the onset, with marked toxæmia and a high mortality.

In forming an estimate of the value of vaccines, we must be guided by general impressions spread over a large number of cases, in the meantime noting the effect on the patient of every injection. During the last fifteen years over 3,000 cases of pneumonia have been admitted into the wards of Mill Road Infirmary, with a total mortality of 19 per cent. During the last five years over 207 cases have been treated with vaccines, and the notes of these patients have been most carefully kept and recorded. The mortality in the cases treated with vaccine is 16 per cent.

I quite admit that this reduction in the mortality is not, in itself, of sufficient import to warrant me in asserting that vaccine is a specific remedy in pneumococcal infections, but I am firmly of the opinion that this treatment is of great value in assisting the patient to fight against the toxæmia, which is always a symptom in pneumococcal infections, and, moreover, I can confidently assert that the vaccine, even in very large doses, is perfectly harmless, and in my hands has never produced a bad symptom.

The following table shows the cases treated, with general result:—

TWO HUNDRED AND SEVEN CASES OF PNEUMONIA.

Age	Cured	Died	Total
Between 1 and 10	28	2	30
,, 10 ,, 20	30	6	36
,, 20 ,, 30	31	4	35
,, 30 ,, 40	25	5	30
,, 40 ,, 50	42	8	50
,, 50 ,, 60	16	6	22
,, 60 ,, 70	1	3	4
	173	34	207

All of the above cases were treated with vaccine (except two, which had serum). Death-rate a little over 16 per cent.

It seems to me, after observing a very large number of cases, that the man who has the best chance of recovery from acute pneumonia is he who has a sound circulatory system, which, of course, includes sound heart-muscle and reasonably elastic blood-vessels. I have, however, long been of the opinion that we are still as a profession at a disadvantage in the treatment of this virulent disease, and our ordinary methods are not sufficient for the attack. We require some weapon which will destroy the virulence of the pneumococcus and its products, and produce a rapid immunity in the blood against it.

Naturally, we turn to some remedy which has been prepared from pure cultures of the pneumococcus of Fraenkel, and it must be either in the nature of a serum or a vaccine. Up to the present it has been found extremely difficult to prepare a serum from the pneumococcus, on account of the insusceptibility of animals to true pneumonia, but a firm of chemists have issued an anti-pneumococcic serum from their laboratory which I have used in some cases, but the results have not been such as to encourage its continuance. A vaccine to be potent ought to be autogenous—that is, it ought to be prepared from the sputum or blood of the patient himself; but this is a matter of great difficulty, as the disease being of such acute and short duration, has either subsided or terminated fatally before the vaccine can be got ready, and it might be borne in mind that to be of real value the vaccine must be injected early in the illness; in fact, if it can be used on the first or second day, it acts at times almost miraculously. If we have to wait until the fourth or fifth or sixth day, when there is a general pneumococcic blood-stream infection, the vaccine is of little value, and seems to exert little or no influence on the course of the attack.

We are thus compelled to use a stock vaccine or a homologous vaccine, prepared from a pure culture of pneumococci isolated from the blood of a patient suffering from lobar pneumonia. In this we are at a great disadvantage, because the strains of pneumococci vary considerably in their virulence and characteristics, so that we are not certain that we are using a vaccine prepared from the same infection as that with which we are dealing. In spite of this disadvantage, however, the results with a stock vaccine are most valuable, and in cases in which I have used vaccines for pneumococcal infections the encouragement has been so great that I will certainly persevere with it in every case. Before narrating to you the cases in which vaccine has been used, it might be well to review very briefly the treatment which was adopted in addition to the vaccine.

The total number of cases of pneumonia in which I have used vaccine during the last three years has been 207, the great majority of them being treated in hospital. This number does not represent all the cases with which we have had to deal, as in some simple cases without any complication it was not found necessary to resort to vaccine treatment, whilst in a number of advanced cases, which were obviously dying on admission to the hospital, it was not considered desirable to administer it. I have, however, included in this list all the cases in which it was given, so that the results may fairly represent the value of treatment. I must, however, say that after my first experience with vaccine it has been found extremely difficult to estimate accurately the true value of the treatment, for the simple reason that we can never be certain that a case would not have recovered without its use; hence we can only be guided by our general impression and observation of the clinical course after each injection. I will show you a few charts representing the effect on the temperature, pulse and respiration immediately after each injection, which will give you some general idea as to its efficacy.

Dosage.—The usual dosage recommended by some writers is 10 to 50 million, with half the amount for children. In my opinion these doses are too small, and to get the full effect of the vaccine it is necessary to give it in larger doses and at the earliest possible moment after the onset of pneumonia. We usually commence with an initial dose of 50 million, followed in twenty-four hours, if necessary, by another injection of 100 million, and in some cases we have even given 150 million with apparently excellent result. I consider the question of dosage by far the most important of all, and as the result of a large experience I am convinced that the vaccine itself is harmless, as I have never noticed anything but a good effect from its use. There can be no question that in a certain proportion of cases it appears to have no effect, and does not seem to influence the progress of the disease one way or the other. On the other hand, in a great many cases an injection of a large dose is followed by a feeling of comfort and relief, associated with a rapid fall in the temperature and slight perspiration.

Effect on Crisis.—We have observed in a large number of cases that the progress of the disease is considerably shortened if vaccine is administered in the very early stages and in repeated doses. In forty-six cases we have given 50 million every four hours for three days, with the result that in the great majority of them the temperature fell and was easily kept under control; the pulse-rate was also decreased, and there was an absence of dyspnœa and delirium, and a more comfortable and less toxic appearance. I quite think that when we are in possession of the correct vaccine or serum pneumonia will be aborted in its early stages, as I can see no reason whatever why the attack should last six, seven or eight days before the fever subsides. We have noticed also that the local physical signs in the lung are not materially changed by the reduction of the temperature, but that is not a matter of serious consequence if we are able to control the fatal toxæmia.

As my temperature charts will show, there is frequently a sudden drop of two or three degrees after a large injection of vaccine, constituting a sort of pseudo-crisis; but, unfortunately, after a few hours the temperature again rises until more vaccine is given. It seems to be necessary before the crisis occurs that a sufficient amount of anti-pneumotoxin should be formed in the blood to counterbalance exactly the amount of pneumotoxin.

The effect of vaccine on the pulse is always good, often reducing it in an hour by thirty to forty beats, but in a few cases in which the blood-pressure was taken no appreciable difference was observed.

Other Pneumococcal Infections.—Following the general rule of vaccines, we would expect to find better results in more or less subacute or chronic pneumococcal infections than in virulent pneumonia. I have only used vaccine in one such case—viz., a general pyæmic condition, with numerous abscesses in many parts of the body, following an attack of lobar pneumonia. Undoubtedly, we observed excellent results follow each injection, and an apparently hopeless case was transformed into a complete cure.

The delirium which so frequently accompanies pneumonia of the apex is possibly explained by the direct lymphatic extension to the brain of a localized pneumococcal meningitis, and we have observed that in such cases the administration of vaccine is nearly always followed by diminution of delirium, and a tendency to natural sleep, but often only of a temporary character. It would seem to be that the ideal treatment of pneumonia would be by means of an anti-pneumococcus serum, but so far we have not succeeded in obtaining one, owing to the difficulty in immunizing an animal. I believe, however, that if the serum of a patient who has just had a crisis could be obtained in sufficient quantity it would act as a true antitoxin in a case of pneumonia, exactly as in the case of diphtheria.

In conclusion, I would like to mention that we have observed a notable absence of complications in those cases treated by vaccines. I do not wish to lay too much stress on this observation, but it is a fact that out of the whole 207 cases not a single empyema has resulted.

I am convinced that we have in pneumococcus vaccine a valuable aid in the treatment of pneumonia, and, although not a specific remedy, it ought always to be used in those cases of a virulent type which threaten the life of the patient.

Mr. DOUGLAS HARMER: I propose to say a few words about the treatment of inflammatory conditions in the upper air passages by vaccines. During the greater part of the past five years I have set aside one day in each week at St. Bartholomew's Hospital for these cases, and Dr. Gordon alone has made more than 200 autogenous vaccines for my patients. Care has been observed in the selection of cases, and the after-history has also been recorded in most of them. It has been found that some people are very susceptible, and that reactions, both local and general, were much more frequent than is generally supposed. In many instances it has been necessary to continue treatment for long periods with gradually increasing intervals, because the duration of immunity varies greatly in different individuals. For instance, one person may be cured of colds with a few doses and remain immune for years; another may need treatment to be repeated every winter; rarely a good result is obtained after a long course lasting one to two years. We have also discovered, first, that better results can be obtained in some diseases than others, and secondly, that vaccines of different organisms have a variable curative effect. For example, the more acute infections of the upper air passages are most commonly due to streptococcus or pneumococcus, either of which may be rapidly fatal from general blood poisoning. To obtain a successful result, in such cases large doses of vaccine should be given early and repeated; these requirements are possible since the introduction of sensitized vaccines, because the latter are less likely to make the patient worse than non-sensitized preparations. In acute streptococcus infection doses of 100, 500 and 1,000 million can be given on three succeeding days, and the result is often remarkable. I have here the chart of a patient who became generally septic seven days after an operation on the tonsils. The man had double middle-ear suppuration, and in spite of operation on the mastoid appeared to be suffering from signs of early meningitis when the first dose was given. A few hours afterwards he was definitely better, and sat up and ate his food. His chart shows a drop of one degree after each injection, and in three days he was well. Similar results have been obtained in other cases by myself and Gordon, and the latter has recently published nineteen cases of acute streptococcic infection, twelve of which made rapid recoveries after treatment with killed sensitized vaccines. These results are of great practical interest to the physician, because it has been found that when an infection of the upper air passages is followed by general septic infection and death, the organisms which are found in the blood are generally streptococci, regardless of the original infection. On the other hand, the pneumococcus cases have been very disappointing, and in the majority of my patients no improvement has been noted after vaccines. I believe, however, that this can be explained. Whereas the former infections are always due to a *Streptococcus pyogenes* of the same type, the latter may be caused by pneumococci of very varying strains. It has also been found that the streptococcus is easy to sensitize, but that the pneumococci are difficult, because there is not at present an anti-pneumococcic serum which does its work well with every type.

With regard to colds, pharyngitis and laryngitis, we have found that these are most often due to infections with pneumococcus and catarrhalis or pneumococcus and influenza in combination. Such infections will cause repeated colds, followed by irritating cough and expectoration. Both adults and children are affected, and suffer in general health. Many of the patients are slightly feverish in the early stages of each attack, and some of them are suspected of tuberculosis. There seems evidence that vaccines will often cure them. In fourteen of my cases treated with influenza and pneumococcus vaccine, definite improvement was noted in eight; and still better results were obtained in the pneumococcus and catarrhalis group, eleven out of fifteen receiving benefit. There is also abundant evidence that vaccines will often cure an ordinary cold, and the question naturally arises whether they should be used for preventive inoculation. When it is known that a severe epidemic, say of influenza, is prevalent in a town, I believe that the general practitioner should have a stock vaccine ready, and, as soon as one case is affected, he should inoculate the rest of the household. Some of his patients will be protected, others may have the disease slightly, none of them will be any worse.

I have also treated a large number of cases of chronic sinusitis, and have found that streptococcus and Friedländer vaccines gave good results. On the other hand, vaccination with pneumococcus, influenza, staphylococcus and coliform organisms have been valueless.

A remarkable effect is sometimes obtained with a sensitized streptococcus vaccine in a chronic infection of the upper air passages. A patient came to our hospital with purulent discharge from her antra and fronto-ethmoidal cells of many years' duration. Her antra were drained, but the discharge was not improved after some months' treatment. She was then given vaccine, and forty-eight hours after the second dose (25 million) the discharge ceased completely in the left nasal fossa. A third dose of 100 million was injected in due course, and seven days later it was found that the suppuration in the right side had almost disappeared. She remained well for three months and then went to Canada.

A second case had had repeated operations on the septum and nasal sinuses. During the past year she had used thirty to forty handkerchiefs regularly every week. She had headaches and very poor health. She was suffering from a streptococcus infection of all the sinuses. After the second dose of sensitized streptococcus her discharge was suddenly reduced, so that she only required one handkerchief a day. Her headaches were slightly better, and the improvement lasted for nine weeks. She did not return, however, for two months, when four more doses were given, with no effect. Six months later the same infection was present, and the vaccine was tried again. After the second dose the discharge immediately lessened, and once more her health improved. One cannot fail to be impressed by the effects produced in these two instances.

In a series of fourteen cases of atrophic rhinitis, treated with vaccine of Friedländer for varying periods, there has been nothing to make one believe that the treatment has any curative value.

As regards vaccines before operations in which there is danger of septic infection, I have also had considerable experience, and the results have so far been good. I believe that it is possible to immunize a patient temporarily against streptococcus and possibly pneumococcus, and so avoid the high temperature, septic wounds, &c., which are so dangerous in our department.

In conclusion, my impression is that we have already reached a point at which it is safe to say that vaccines have a definite curative value in some of our complaints, and that better results can be obtained with some vaccines than with others. There is no doubt that the problems must receive a great deal more attention before vaccines will be of great practical value to the laryngologist who is not interested in bacteriology. As regards the dangers, I must draw attention to the great susceptibility of some of these patients, especially to influenza vaccines, which are often very depressing. It is easy to exacerbate the symptoms without a corresponding later improvement. Instances have also been met with of high temperature (four cases), mental depression, epistaxis, inflammation of glands (two cases), ears (two cases), joints (one case), skin, nerves (two cases of severe neuritis), eyes, jaundice (one case), which were probably due to the vaccine. In two cases there was a return of phthisis, one suffered from erysipelas, one from carbuncle, and one from double pneumonia, within three months of treatment. I know of no case which was made permanently worse by inoculation.

Dr. Agnes Savill: I began to use vaccines in 1908 and 1909, and at first made many errors. I saw acne and boils aggravated under my injections. Later I found out the cause—errors of *dosage* and *intervals of administration.* Also, even when the same germ is employed, different dosage is required in different forms of infection—e.g., acne bacillus has different dosage for acne, comedo, and scalp seborrhœa. Cases treated: Comedones, acne, boils, seborrhœa oleosa, staphylococcal infections of scalp in children, sycosis of chin, folliculitis in other parts than chin, alopecia areata (certain types), one case of lupus erythematosus (tuberculin), acne rosacea, a few cases of bacilluria and mucous colitis, one case of chronic nasal discharge, "colds in the head." Of these, there is no doubt as to the magical effect of an initial small dose (50 million) of *Staphylococcus aureus* for boils. In long-standing recurring cases, vaccines have done more than all other treatment. In that obstinate disease, folliculitis of the scalp in children, a stock staphylococcus vaccine will improve immediately a condition for which any local antiseptic and internal tonic treatment has been tried in vain. It does not always cure at once, but may need repeated doses. The autogenous vaccine succeeds sooner. In sycosis the effect of a *Staphylococcus aureus* vaccine is sometimes marvellous; in others, even the autogenous vaccine fails. These are the cases where even X-ray epilation fails.

The acne bacillus is the vaccine most employed in my work. In *comedones*, the acne bacillus yields remarkable results in most cases. There is a type of skin which looks sallow, not due to the common raised comedo, but due to innumerable patulous sebaceous duct mouths, in each of which is a black speck. In these conditions soap, washing, and exfoliating remedies do little: after a course of ten weekly injections of acne bacillus, 2 to 10 or 30 to 90 million, the entire complexion is strikingly clear; the patient looks in better health because of the rosy clearness replacing the old sallow effect of the cheeks and brow.

The name "acne vulgaris" covers a number of widely different conditions. Where the papules are small, and obviously round a comedone, stock vaccines will yield success. If weekly doses of 5 to 20 million fail, doses of 1, 2, or 4 million, at intervals of ten or fourteen days, will often succeed. This latter method of very tiny doses I learned from Sir A. Wright himself. In other cases I have found 40 to 90 million give the best results; but over 90 million usually aggravates. One can tell after the second injection what will best suit the individual case. When very large, red, angry papules and deep-seated pustules cover the face, vaccines will not cure, but only ameliorate the condition. General practitioners nowadays use vaccines freely for acne vulgaris, because they have a few startlingly successful results; in other cases no effect whatever is produced by the vaccine. In my experience every case has to be individually treated. Where there are many tiny papules over the body and dermatographia, I regard the condition of acne as being complicated by a toxæmia; and in such cases I have never found vaccines alone, either acne alone or combinations of acne and staphylococcus, stock or autogenous, cure the disease. I obtain good results by other methods of treatment, without using a vaccine at all, or only as an occasional adjunct to treatment. Treatment of the alimentary tract, diet after Dr. Cammidge's method, usually decreasing the intake of carbohydrates, may be all that is needed. In other cases thyroid extract, 1 or 2 gr. daily, calcium lactate three days a week, calomel $\frac{1}{10}$ or $\frac{1}{20}$ gr. at night, and best of all, dilute sulphuric acid, 20 minims three times a day. The sulphuric acid is the best therapeutic remedy I have found for pustular conditions. Last year there was correspondence on its efficacy in the *British Medical Journal.* I tried it, as I try every new highly recommended remedy, anticipating failure. To my surprise and delight it has more than fulfilled its promise. I had previousely tried various antiseptics by the mouth without much benefit: levurine, salol, calomel, sour milk.

In last week's *British Medical Journal*,[1] Professor Adami, of Montreal, has an interesting article on intestinal stasis, in which he states that chronic pustular infections of the skin are due to a low infection from the bowel. With this my experience agrees; it is obvious that vaccines in such a condition cannot cure. I have therefore almost ceased to employ vaccines in the angry chronic acne, and treat instead the alimentary tract as above described. But what does dilute sulphuric acid do? I should be grateful if any therapeutist can inform me as to the rationale of its action.

I shall not take up your time with describing the few cases of bacilluria and mucous colitis I have seen improved with small autogenous doses. The only condition on which I can claim to have the special knowledge which can justify me taking up the time of this Section is *seborrhœa oleosa.* The unique value of large doses of acne vaccine for seborrhœa oleosa and alopecia (or baldness) due to or accompanied by that germ was discovered by me in 1908; and I have published two articles on the beneficial effects and cures observed in some twenty cases. My practice brings to me many women and a few men who have developed marked oiliness of the scalp accompanied by profuse hairfall. Even in women I have seen the vertex of many scalps at the age of 35 as thinly covered as those of the majority of men at the age of 50. I examine every case microscopically, and never give vaccine unless I find the microbacillus teeming. Lotions, ointments, X-rays, washings, hold the disease at bay; they never cure it. In only four out of the twenty-seven cases I have now collected have I failed to check the disease; two were women, of 23 and 39 years of age respectively, and in these I have not yet succeeded in finding the dosage which will check the multiplication of the microbacillus in their scalps. In the successful cases the germ cannot be found after ten injections; and the patient spontaneously remarks that the hair no longer sticks together. Small downy hairs appear on the scalp of men; with women, these become long and a healthy new growth ensues.

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[1] *Brit. Med. Journ.*, 1914, i, p. 177.

Dr. David Nabarro: I had intended originally to limit my contribution to this discussion by giving you an account of two cases of acute streptococcal infection, one of which at least was a case of streptococcal septicæmia, which were benefited and restored to normal health by the use of *unkilled* sensitized vaccines. In view, however, of the general trend of the discussion, I should like to be permitted to make a few general remarks upon the value of vaccines in treatment. In common with several of the previous speakers I am myself convinced of the value of vaccine therapy in suitable cases. It may be said that as bacteriologists we are naturally biased in favour of vaccines. Whether that be the case or no, there is no doubt that a considerable number of general practitioners and patients are themselves convinced that vaccines do good. I have frequently had patients whom I have treated for chronic and recurring colds, for chronic nasopharyngeal and bronchial catarrh, and for infections of the urinary tract, return to me to have a fresh vaccine prepared, as a previous vaccine had done them so much good. Of course, we all realize that vaccines have their limitations and that they often fail to *cure* a chronic catarrhal or infective condition of long standing, but that they can and do ameliorate the patient's condition by helping him to keep the infection or catarrh within bounds and so relieving symptoms there can be no doubt. I can give you one or two concrete instances of this. We recently had a patient—a girl about a year old—in Great Ormond Street Hospital, under the care of Mr. Fairbank and Dr. Poynton, who was profoundly ill from some urinary tract infection. The kidneys were found to be considerably enlarged, and the case was regarded as one of pyelonephritis. I found many pus cells and organisms in the urine and on cultivation three distinct intestinal organisms were isolated from the urine. The child appeared to be dying and I was given permission to try a vaccine. I made a mixed vaccine of all three organisms and gave the child four injections. Already after the first injection her condition began to improve and she was recently discharged from hospital looking the picture of health. Nevertheless, she still has a few pus cells and some organisms in the urine. I have repeatedly had similar results with kidney or bladder infection in adults. By means of vaccines we can reduce the number of pus cells and organisms in the urine, reduce the fever and relieve pain and other local symptoms. Although we may be unable to cure these patients, we do assuredly help to make life more bearable for them. It is important to bear in mind one fact in this connexion. The urine should be examined from time to time to ascertain if the same organism is the cause of the trouble. I once had a case in which four different organisms were isolated from the urine of a child at different times within one year. They were *Bacillus coli non-aerogenes*, streptococcus, *Bacillus proteus*, and *Bacillus coli communis*. This remark about re-examination of the material voided applies equally well to mucus from the nose or pharynx and to sputum. At one examination we may isolate a streptococcus and *Micrococcus catarrhalis*, a combined vaccine of which will cure the patient's cold or catarrh and keep him free from cold for six or even twelve months. Then he may develop a cold which the vaccine does not touch. On examining the expectoration one finds the reason for this. The dominant organism now, or even the sole organism, may be the pneumococcus. A pneumococcus vaccine, or some of the patient's pneumococci added to the original vaccine, again brings about a cure. That I practise what I preach will be apparent when I tell you that I have cured myself of a chronic cold, which I developed about three months ago, by giving myself a weekly injection of a stock mixed vaccine containing streptococci, pneumococci, a nasal-diphtheroid bacillus, and *Micrococcus catarrhalis*.

I come now to the account of two cases of streptococcal infection which I have treated with sensitized vaccines.

Case I was that of a boy, aged 10, who was admitted to Great Ormond Street Hospital on October 27, 1913, under the care of Mr. Fairbank. The history was that for three weeks before admission he had severe pain behind the right ear and that there was some discharge from the ear one day before the pain started. No discharge since. The pain became worse, with repeated rigors and occasional vomiting. He became dull and lethargic before admission. On admission the patient looked very ill; he was dull and slow in answering questions. There was some œdema over right mastoid and pain on percussing around. No paralysis: no thrombosis of internal jugular vein felt. Temperature, 103° F. on admission. The next day, October 28, he was operated upon by Mr. Fairbank. The mastoid was opened and found to be healthy; the sinus was exposed and found to be thrombosed; the internal jugular vein was tied in the neck; the sinus was opened up forwards as far as possible and back almost to the torcula; the wound was packed with gauze. A culture was taken at the time of the operation, from which I grew a pure streptococcus. Although the wound looked quite clean, the temperature, which came down to normal for about thirty-six hours after the operation, gradually went up, and there was a daily evening rise to between 102° and 103° F. On November 5 I gave him a 5-million dose of stock streptococcus vaccine (as I had not been asked to make an autogenous one). The temperature went even higher after this and the patient had a rigor. Two days later I injected 5 millions of living autogenous sensitized streptococci, but the next day the temperature was higher than ever before—105·2° F. This made me rather nervous about repeating the injection of vaccine and I stayed my hand. The child grew worse, the temperature rose each day to between 103° and 105° F., and on November 14 I obtained a copious growth of streptococci from the blood. Thereupon, for seven days, the child was injected with 10 c.c. of antistreptococcic serum daily, but without any obvious result. In the meantime I had prepared another autogenous sensitized vaccine of the streptococcus isolated from the blood. Of this I injected 10 million on November 20—result practically *nil*; 20 million on November 22—result, temperature down to between 99° and 100° F.; and 40 million on November 24—result, temperature rise to 102° F. the next day—no doubt a reaction due to too big a dose. Five days later there was a rise of temperature to 101·4° F., but after that the child never looked back, the temperature was normal, the blood sterile on culture, and the boy was discharged well on December 31, 1913, with the operation wound nearly healed.

The second case was one of scarlet fever, which I saw recently in consultation with Dr. Van Praagh, of Hampstead. The patient was a boy, aged about 12, who developed scarlet fever on or about December 20, 1913. The attack was a severe one, with the temperature about 103° or 104° F. for a fortnight. On January 3, a large suppurating group of glands on the right side of the neck was opened by Mr Ware. The temperature dropped somewhat after this, but was never normal, except on a few occasions on January 8 and 9. About this time the temperature began to go up at night, 99·8° F. on January 8, 101·2° F.

on January 9, 103° F. on January 10, and 105° F. on January 11. The child's condition had obviously become serious; he appeared to be ill and the neck was more painful. On January 11, I saw him in consultation with Dr. Van Praagh and Mr. Ware. We agreed that it looked as though the child had a streptococcal septicæmia. I took some blood from a vein, but failed to grow streptococci. Almost pure streptococci were grown from the discharging sinus in the neck. At the same time I injected 10 millions of a stock sensitized streptococcus vaccine. The temperature immediately fell to normal, and remained down till late on the third day. In the ordinary way I should have given another dose on the second day, but as he seemed so much better I did not do so. However, as the temperature rose to 102·2° F. on January 14, I injected 20 millions of streptococci, and 40 millions on January 18. With the exception of a rise to 102·4° F. four days after the last injection, the child has had a normal temperature and is now well.

I have used other living sensitized vaccines than streptococci and from my experience I can say that though unkilled they are harmless in suitable doses. I believe there is a great future before them in the treatment of acute infections and that in many cases they will be found preferable to serums, and far more efficacious.

I should like to express here my indebtedness to Professor Besredka for kindly showing me his technique and for furnishing me with the necessary serum; also the various clinicians whose cases I have here quoted for their permission to refer to those cases and notes.

Dr. Bezly Thorne: In response to the President's suggestion that those who have had clinical experience of the effects of autogenous vaccines should place it before the Section, I have selected from my case-books three examples which I hope may be of interest.

Case I is that of a woman aged 49. Seen on June 29, 1912. Face sallow: climacteric menstrual irregularity; excessive moisture of the skin and occasional violent perspirations, involving change of body linen, by day and by night; one or two fragmentary or loose fœtid yellow stools daily before breakfast; much flatus; cardiac asthenia with dilatation, apex 5 in. from the mid-sternal line. Treated for gastro-intestinal autotoxis and the cardiac condition. By July 31 the evacuations had become of a dark brown colour, free from undue fœtor, but remained fragmentary in consistency; there was no excess of flatus. The perspirations had ceased, and but for some fibrositis, connected mainly with the transverse processes of the cervical vertebræ, the patient felt quite well. She returned, however, on July 8, 1913, with a persistent tracheal catarrh, accompanied by wheezing and a tendency to asthma. The stools had again become pale yellow and semifluid. A culture was made, and after the second injection the patient left London and the treatment was continued by her medical attendant in the provinces. Last week she reported that the result had surpassed her expectations, and that she enjoys perfect health, with complete freedom from all the former symptoms and trouble.

Case II is that of a man, aged 50, seen on March 5, 1913. Thirty-five years' service in India; tortured with heartburn and flatus; diurnal somnolence; languor and general defect of energy; stools dark brown, loose, frothy, and emit a heavy fœtor which is recognized as having characterized them during rainy seasons in India. Under treatment for intestinal autotoxis, the heartburn, flatus, fœtor, and diurnal somnolence subsided in a fortnight and the patient expressed himself as being well. The stools, however, with few exceptions, remained semifluid until about a month later; but about that time there occurred a recrudescence of a recently latent rheumatoid condition of the hands. I then advised an examination of the teeth and of the blood. Writing in the following October, the patient reported as follows: "For the last few months I have been perfectly well. . . . Professor Goadby established that the *Bacillus necrodentalis* is infecting my blood and I am being treated accordingly with vaccine, supplemented with local treatment. The result is already very beneficial. Everything has turned out as you predicted." I may add that the maximal blood-pressure had fallen from 170 to 130 mm. Hg.

A point of interest in these two cases is that, although great improvement followed treatment of the alimentary canal, something of the nature of metastasis seems to have occurred, taking the form in the one case of what formerly would probably have been called gouty tracheitis, and in the other of a rheumatoid condition.

Case III is that of a man, aged about 50, first seen on September 8 last. Had been declining in health for three years; walking had been curtailed by degrees on account of pain referred to the region of the heart and to the left arm, until he had been reduced to remaining mainly in bed with the attendance of a nurse, because of the pain brought on by the attempt to perform his ablutions or even to brush his teeth. His condition had been pronounced to be very grave, and he had inferred that nothing more could be done for him. I found his condition to be as follows: Apex beat a little outside the nipple line; sounds scarcely audible and tick-tack in character; every fourth to sixth beat dropped as to both auricular and ventricular rhythm; intense fibrositic tenderness of the chest-wall, especially of the apical, xiphoid, and left supramammary regions; pressure on the last named sends pains down the left arm. The bowels act two or three times a day, the motions resembling yellow paint; all teeth, except one lower incisor, extracted three years ago for pyorrhœa; the remaining tooth, recently examined, found to be aseptic. After about six weeks treatment for the alimentary and cardiac conditions, with exclusion of all vaso-dilators, the patient was able to leave London and take daily walking exercise; but the "yellow paint" motions persisting, Dr. John

Eyre was asked to examine them. His report was as follows: "October 27, 1913. *Bacillus coli* is present, but very large numbers of streptococci also. This is quite the usual association to be observed in cases of persistent fibrosis, especially when pyorrhœa has been pre-existent." Four days after the first injection, healthy, formed, brown stools began to be evacuated and persisted for about a month. Since then they have shown a tendency to become loose, while retaining the normal colour, and there was a return for some time of the breast pain. The patient is still under treatment and can now walk from one to two miles in comfort and go to places of amusement. The heart dimensions are normal and the rhythm is interrupted at intervals of from ten to twenty or more beats only.

These cases, although differing materially as to symptoms, and, in some respects, in regard to treatment, have this in common: that, having been brought within measurable distance of recovery by measures of which pharmaceutic and dietetic treatment of alimentary toxæmia formed part, there remained, nevertheless, conditions impairing the completeness and permanence of restoration to health, which were not corrected until recourse was had to autogenous cultures. The third case is interesting on account of the persistence of the pathogenic organism long after the removal of the causative condition.

May I be allowed to add that observations made during twenty years of treatment of the circulatory organs, in which attention has throughout been directed to causative autotoxis, have convinced me that no scheme of cardio-vascular therapy can be regarded as complete without antitoxic precautions; and that antitoxic treatment must, in some cases, include recourse to autogenous vaccines.

Dr. R. H. Elliot said that the view which had been put forward by one of the openers of the discussion, that ophthalmologists were not in favour of vaccine treatment, and that this was due to the sluggish circulation in the eye hindering the ingress of the remedies, did not, in his opinion, represent the facts of the case. Like every other branch of medicine, there were to be found in ophthalmology the optimists, the pessimists, and the much larger body of men who, amongst many failures, could look back on some results from vaccine treatment which could not be got by any other means; they were still groping, but they would not be willing to give up vaccine therapy on any consideration. He had had some very encouraging results in deep-seated inflammatory affections of the eye, by using vaccines made (1) by massaging the prostate for gonococcus, and (2) by cultivations from pyorrhœal gums.

He mentioned that immunization for boils in India by means of vaccines (*Staphylococcus aureus*) frequently relieved patients of chronic and troublesome muscular rheumatism. The same result was, however, attained in that country by means of other vaccines, and also by means of sera, notably by the plague prophylactic. These were well-established facts, and whilst he did not mean for a moment to suggest a doubt as to the specificity of the action of vaccines and sera, he did suggest that some at least of them possessed a para-specific action as well as a specific one. This view had been warmly championed by Darier.

The President (Dr. Samuel West): It now remains for me to endeavour to sum up the results of the discussion. The Council, I think, has been proved right in restricting the discussion by excluding tuberculin, so that attention should be focused upon other affections than tuberculosis. The first question that arises is whether, in the case of those diseases of which little or no mention has been made, judgment is to go by default. This much we may, at any rate, assume, that they would not have been disregarded had there been evidence of weight to appeal to. One point comes out clearly. That a sharp distinction must be drawn between the cases of acute general infection and those in which the infection is subacute or chronic. To septicæmia and malignant endocarditis reference has been made, but only to say that the results of vaccine treatment of these are very disappointing. So, too, with acute meningitis and typhoid fever. Pneumonia was dealt with by only one speaker. His cases, though selected, yielded a general mortality of 16 per cent., which is about the average for unselected cases without vaccine treatment, so that the result is not encouraging. The general conclusion is thus arrived at, that in the acute general infections vaccine treatment offers but little prospect of benefit. This agrees with the experience of tuberculin, for amid all the points of difference, almost the only one upon which all writers seem agreed, is that it is useless or mischievous when the disease is in the acute stage. Startling and brilliant cases of success have been recorded, but they are so exceptional that there is room for doubt whether the success can be attributed to the vaccine treatment alone, especially as similar cases were not unknown of strange and inexplicable recovery in pre-vaccine days. We thus seem to get a partial answer to one of the questions propounded—viz., the contra-indication—for the one great contra-indication to the use of vaccines appears to be acute generalized infection. It is in this group that the instances most frequently occur in which definite harm follows their use.

Most of the affections dealt with in this discussion belong to the subacute or chronic category.

The widespread use of vaccines, which now prevails in ordinary practice, is essentially unscientific, and cannot yield results of any practical value. The one thing it shows is that both patients and practitioners have little fear of ill-effects from their use. Whether this is entirely justified or not may be open to question. More accurately stated it shows, as Dr. Briscoe stated, that no *permanent* harm results. Yet temporary harm may follow, sufficient, it may be, to compel their discontinuance, as several speakers maintained. There seems also to be no doubt that long-continued vaccine treatment has its dangers, for patients may fall into a condition of profound asthenia and die of it, a condition similar to that which develops in the later stages of Addison's disease.

The next point is that vaccine treatment is in most cases not successful by itself, unless supplemented by ordinary treatment. Frequent reference was made to this fact, that when pockets of infection are present vaccines will do little or nothing till draining is complete, and that it is from these pockets that reinfection and consequent recurrences occur. Yet drainage alone without vaccines may suffice to cure. Here we come face to face with the difficulty of determining the value of any therapeutic measure. To do this it is necessary to be familiar with the natural history of the disease. We must know what will happen if the disease be left to Nature or to Nature aided by the ordinary methods of treatment, and then we must be able to show that when these have reached their limits the use of vaccines produces further improvement or cure. Thus is brought home to us the necessity of close co-operation between pathological investigation in the laboratory and clinical observation in the wards, for it is only by the test of clinical experience that the value of any remedy in disease can be ultimately decided. There must, therefore, in the highest interests of science, be no jealous rivalry between the two departments of research, but the most hearty and loyal co-operation, based on mutual respect and good feeling.

The general position of vaccine treatment at the present time has been well stated for us by Dr. Horder. Failures, he says, are more common than successes, and though there is no doubt about the efficacy at times of vaccine treatment, still in the mass the results are disappointing. This seems to be damning vaccine treatment with faint praise; but we may put it less harshly, and say that the early enthusiasm and hopes excited have been largely tempered by experience. Still, in the face of the many present disappointments, the future holds out some promise. Our present efforts may be clumsy and often misdirected, yet practice and experience may improve them, and give them the precision they require. This involves careful scientific study, both on the pathological and clinical side, for the questions are complicated and difficult. One thing is quite clear, that a general indiscriminating haphazard use of vaccines can only bring the method into disrepute and retard progress.

Medical Section.

February 24, 1914.

Dr. Percy Kidd, Vice-President of the Section, in the Chair.

Paroxysmal Tachycardia in a Child, aged 2¾.

By Robert Hutchison, M.D., and John Parkinson, M.D.

W. M., aged 2¾, was admitted to the London Hospital on June 6, 1913, under the care of Dr. Robert Hutchison.

History: Ten days before admission the child was drowsy and fretful during the afternoon. In the evening he complained that he had fallen down. No sign of injury was found, but the parents then noticed a throbbing in his neck. He vomited four or five times during that evening and looked exhausted. After a night's sound sleep he seemed brighter, though the throbbing persisted. He complained while climbing some steps that his chest hurt him. At night he seemed very tired, and the parents noticed that the heart was beating very rapidly. During the next six days he was kept in bed by the doctor's orders. He was cross, seemed half-conscious at times, and did not get proper sleep. The throbbing in the neck and chest continued. On the seventh day of the illness the face became swollen, especially around the eyes; this continued until admission. He never appeared blue, and no swelling of the legs was noticed. On the ninth day of the illness he passed scarcely any urine. He was only half-conscious and seemed "like a dying child." On the tenth day of the illness he was sent to hospital with a suggested diagnosis of meningitis.

Previous health: The parents, who are healthy, were married in 1909. The patient was born on August 29, 1910, and was breast-fed for ten months. He had been perfectly well until the present illness. He had not suffered from any infective disease except an occasional cold, nor from any aural or nasal discharge.

A second child was born in 1912 and is healthy. There were no miscarriages.

Condition on admission: The child was well built and nourished. He seemed content and lay flat without distress. The face was puffy, especially around the eyes. Acute nephritis was first suggested, but the scanty urine, examined twice, contained no albumin. The heart was very rapid, "more than 160 per minute by auscultation." There was marked and rapid pulsation in the neck. The heart sounds were of a tick-tack character and unaccompanied by murmurs. The respirations were 30 per minute; there was no objective shortness of breath. The liver extended three fingers' breadth below the right costal margin and it pulsated.

The patient slept well and his physical condition remained the same, except that pitting of the ankles was noticed for the first time on the eleventh day of the illness. Only a few ounces of urine were passed. On the twelfth day of the illness, the third after admission, the pulse was found to be 80 per minute and the heart sounds normal. The liver was only one finger's breadth below the costal margin, and the œdema had disappeared. About 30 oz. of urine were passed during the next twenty-four hours.

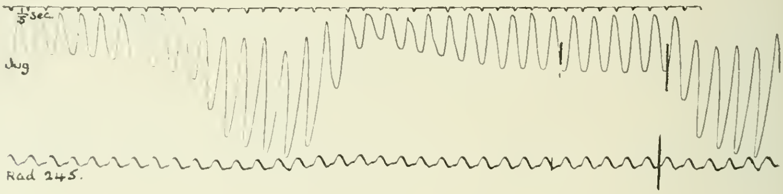

Fig. 1.

A polygraphic tracing during the second attack, June 11, 1913. Rate, 245 per minute.

Second attack: On the morning of June 11, three days after cessation of the first attack, the child was allowed to sit up in bed. Shortly afterwards it was noticed that the pulse had again become very rapid. The liver extended 1 in. below the costal margin and pulsated. The first polygraphic record was taken four hours later and showed a regular radial pulse of 245 per minute. The jugular tracing showed a single large wave at the same rate (fig. 1). An electrocardiogram presented the same appearances as that in subsequent attacks. Five hours after the beginning of the attack the child seemed comfortable and happy.

There was neither cyanosis nor œdema. Rapid pulsation was visible in the neck and in the third and fourth left intercostal spaces over the heart. The apex beat was in the fourth space, 3½ in. from the middle line. The area of cardiac dullness extended above to the third rib, to the right ½ in. and to the left 3½ in. from the middle line. The heart sounds were unaccompanied by murmurs. The respirations were 20 per minute and deeper than before the attack. There were no abnormal signs in the lungs. The liver extended 1 in. below the right costal margin. The spleen was not felt. There was neither œdema nor ascites. Twelve hours after the onset the physical signs were the same. A polygraphic tracing showed a pulse-rate of 236 per minute. The child slept well and the pulse was still uncountable at the wrist before breakfast on the next morning. During breakfast the child vomited, and it was then found that the pulse was 95 per minute. A few minutes later a polygraphic tracing showed a pulse-rate of 84 and a normal sinus arrhythmia (fig. 2). An electrocardiogram taken in the morning showed a sinus arrhythmia with "escape of the ventricle" (fig. 5). The duration of the second attack was twenty hours.

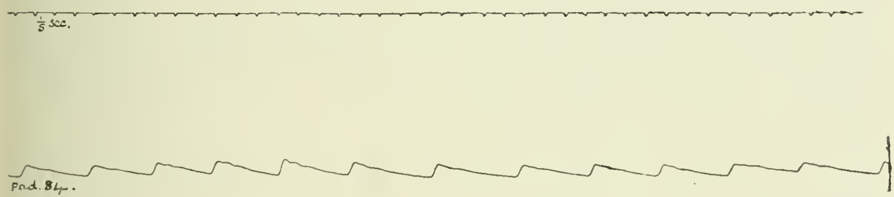

Fig. 2.

A radial tracing shortly after cessation of the second attack, June 12, 1913. The rate is 84 per minute; sinus arrhythmia is present.

During the next ten days the child was perfectly well. The pulse-rate was 64 to 80 per minute, and tracings showed merely a sinus arrhythmia. The systolic blood-pressure was 100 to 110 mm. Hg. (Riva-Rocci sphygmomanometer). The respirations were 20 per minute. There were no abnormal physical signs in the heart. The apex beat now measured 3 in., instead of 3½ in., from the middle line. The liver was just palpable.

On June 26, 1913, the patient was discharged, and he remained quite well until September 22, 1913.

Third attack: On September 22, 1913, the third attack began.

Again the parents noticed throbbing in the neck. The child said he felt sick. Radial pulse tracings showed a rate of 215 per minute. Electrocardiograms were of the same character as those taken during previous attacks (fig. 3). During the night the child vomited, but this did not terminate the attack. At 8 a.m. on September 23, the radial pulse was found to be 118, and at 11 a.m. it was 105. An electrocardiogram showed the normal rhythm (fig. 4). The third attack had lasted about twelve hours. The physical signs were the same as those during the attack. The Wassermann reaction in the blood serum, made on September 30, was negative. The child was discharged, and remained well until October 3, 1913.

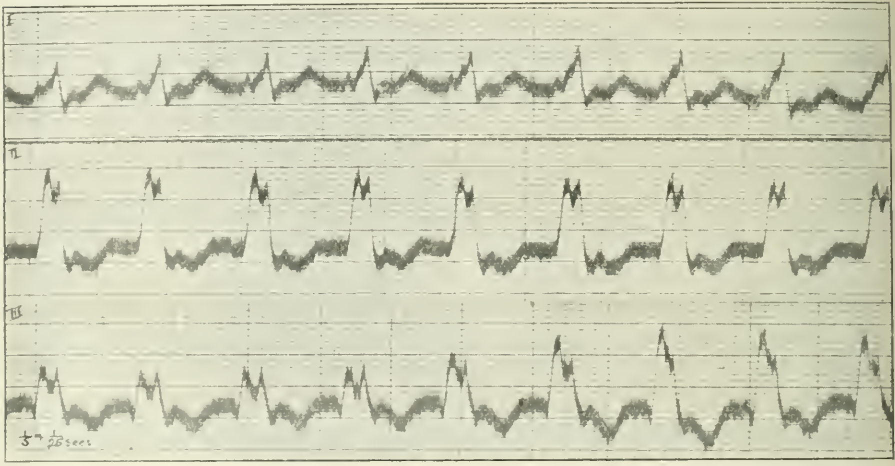

Fig. 3.

The electrocardiogram obtained during the third attack, September 22, 1913. It is similar to those obtained in the second and fourth attacks.

Fourth attack: On October 3, he was again admitted, four hours after the onset of the attack. The pulse-rate was 213, the blood-pressure 85 to 90 mm. Hg. The child appeared cheerful and no abnormal signs were seen beyond the rapid pulsation in the neck and præcordia. The liver was not enlarged. On October 4, the pulse-rate was 212 per minute, and the liver was 1¼ in. below the costal margin. On October 5, the pulse-rate was 227 at noon. There were no symptoms of distress. In the evening, immediately after defæcation, the attack ceased, and the pulse was found to be 120 per minute. The fourth attack had lasted forty-eight hours. Three hours later the pulse-rate was 100, sinus arrhythmia was well marked, and a continuous tracing for ten minutes showed no premature contractions or other abnormal rhythm. The liver was just palpable. For another week the child remained in hospital. The pulse-rate was 70 to 80 per minute. He was discharged well on October 12, 1913.

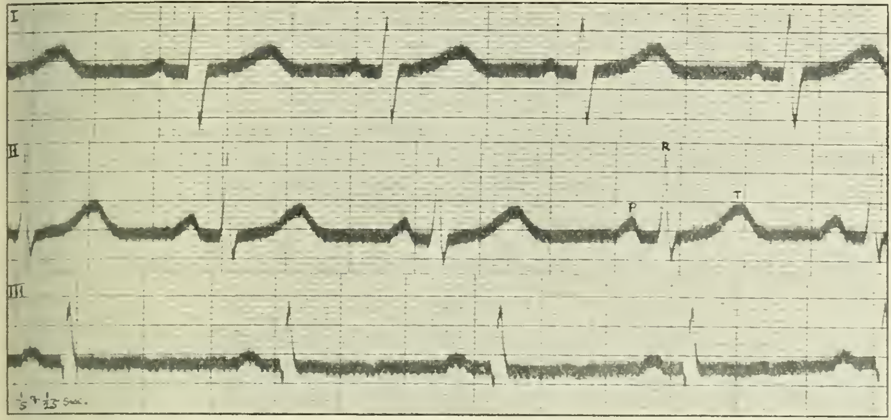

Fig. 4.

An electrocardiogram shortly after the termination of the third attack, September 23, 1913. It shows the normal rhythm.

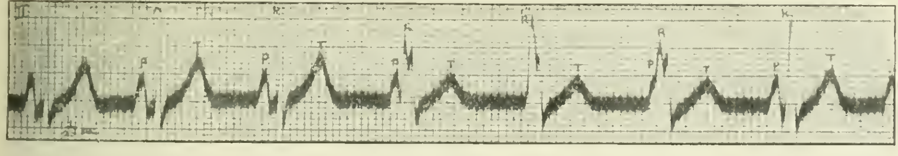

Fig. 5.

An electrocardiogram (Lead II) taken shortly after the termination of the second attack, June 12, 1913. It shows “escape of the ventricle.’ Retardation of the auricle (P), due to sinus arrhythmia, leads to a passing idio-ventricular rhythm.

There had been no more attacks when he was last seen on February 21, 1914, and he appeared quite well.

REMARKS.

This case of paroxysmal tachycardia appears to be the youngest yet recorded. The œdema of the face which appeared during the long paroxysm produced a superficial resemblance to acute nephritis. In cases where no cause is found for an acute heart failure in young children the possibility of paroxysmal tachycardia should be borne in mind.

The prominent pulsation in the neck, often described as carotid, is probably always venous. The large waves shown in the tracing from the neck (fig. 1) are too high to be due to carotid pulsation, when the radial beats accompanying them are so small. Moreover, the waves in question do not coincide with the expected position of the carotid (*c*) wave. They are due to contraction of the auricle during ventricular systole, and a consequent retropulsion of blood into the jugular veins. The electrocardiogram (fig. 3) is difficult to understand and no interpretation is put forward. It is obvious that the rhythm of the heart is entirely altered in character during an attack; the change is not merely one of rate. Premature contractions were never seen in this patient during the frequent observations and tracings. Pulsus alternans was never recorded.

OTHER RECORDED CASES.

Paroxysmal tachycardia dates from childhood in a certain proportion of cases. Accounts of actual attacks in childhood are rare.

Herringham's case [3] was a girl, aged 11, who showed seven attacks within ten months. They had been present since the age of 5. The duration of the paroxysms varied from one and a half to thirteen days. The rate was 200 to 250. Distress was slight. The liver enlarged and once pulsated. The urine was scanty. Œdema never occurred.

Buckland's case [1] was also a girl, aged 11, with a similar history of onset about the age of 5. The longest attack lasted ten days.

Merklen [5] describes paroxysms in a girl, aged 13, lasting eight days, two days, and twelve hours. On the fifth day of the longest attack the liver was enlarged and hæmorrhagic sputum was expectorated. The pulse-rate was 220.

John Hay [2] records a case in a delicate boy, aged 6. The onset and offset were not observed, but it is an undoubted case of paroxysmal tachycardia and excellent polygraphic records are given.

Hume [4] has described attacks in a girl, aged 6, during the course of a severe attack of diphtheria. On the forty-first and on the fifty-first days of the illness, while the child was vomiting and in a grave collapsed condition, polygraphic records showed the occurrence of short paroxysms of tachycardia. These did not return and the patient recovered and left the hospital eleven weeks later.

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[1] Buckland, F. O. *Trans. Clin. Soc. Lond.*, 1892, xxv, p. 92.

[2] Hay, John. *Edinb. Med. Journ.*, 1907, xxi, p. 40.

[3] Herringham, W. P. *Trans. Clin. Soc. Lond.*, 1897, xxx, p. 99.

[4] Hume, W. E. *Heart*, Lond., 1913, v, p. 25.

[5] Merklen, P. *Semaine méd.*, Par., 1901, xxi, p. 164.

DISCUSSION.

Dr. G. A. Sutherland congratulated the authors on having secured a case of paroxysmal tachycardia at such an early age, and having been able to make such a careful study of it. It was clear that at the age of 2½ most of the alleged causes of paroxysmal tachycardia might be dismissed, and at the same time it might be assumed that in other respects the heart was organically sound, so far as physical examination and the absence of symptoms could be relied on. This raised the question as to whether the onset of paroxysmal tachycardia in an apparantly healthy heart was due to a functional disturbance or to disease. He thought the origin of such attacks in the form of a new rhythm starting in some abnormal focus of the heart had been definitely proved. The new rhythm might seriously affect the mechanism of the heart, and if the paroxysm were sufficiently prolonged might lead to definite signs of cardiac failure. He had met with an example of this in a boy, aged 10, whose heart was apparently sound in every way, but in whom a prolonged attack of tachycardia had induced signs of cardiac failure. It had been rather a revelation to him to find heart failure occurring in the absence of any disease and as the result merely of a disordered rhythm. The question of treatment might not be of importance in connexion with brief attacks, but when the heart began to give out something had to be done. In this condition he had pushed the use of digitalis, with the view of producing partial heart-block and also checking the excitability of the auricle, and had found this successful.

Dr. Alexander Morison regarded the case related by Dr. Hutchison and Dr. Parkinson and those referred to by Dr. Sutherland as interesting clinically and in their bearing upon the nature of paroxysmal tachycardia. While acknowledging with Dr. Sutherland the advances which have of recent years been made in our knowledge of the nature of cardiac action, he found that he occupied a position of some isolation at the moment in not having the same conception of the mechanism of these cases as was at present entertained by many others. Dr. Sutherland appeared to indicate an activity of the auricle in the production of the ventricular tachycardia from the shape of certain venous waves which he assumed were significant of a synchronous auricular and ventricular contraction. He (Dr. Morison) had, however, observed the same waves in cases of so-called auricular fibrillation of the tachycardial type. Dr. Morison regarded the auricle as paralysed from distension in these tachycardial cases, and the so-called ventricular type of auricular wave as due to a retrograde impulse from the tachycardial ventricle which may be causal even of the liver pulsation manifested in such a case as that related by Dr. Hutchison. He had himself ceased to employ the term "arrhythmia" in his nosology, and regarded the term "extrasystolia" as more conveniently indicative of the condition present in paroxysmal tachycardia, which he considered to be a tachycardial ventricular extrasystolia independent of any auricular origin, a condition which has been termed by some "massed extrasystole." Taking this view, and remembering Professor Cushny's demonstration of the fact that the steadying action of digitalis in auricular fibrillation may be manifested without evidence of block in the auriculo-ventricular textures, he questioned the auricular origin of both regular and irregular ventricular tachycardia—the latter condition, usually described as auricular fibrillation, he regarded as an arrhythmical massed ventricular extrasystolia. He referred to a case of rhythmical paroxysmal tachycardia which suddenly subsided into normal action as his finger was on the patient's pulse, which for the time left the patient in a condition of subjective comfort, to be followed within twenty-four hours by a suddenly developed loud mitral bruit indicative of ventricular dilatation, and this soon afterwards by death in asystole. This sequence of events pointed, in his opinion, to a ventricular origin of the paroxysmal tachycardial state and to the beneficial effect of digitalis in tachycardial conditions, most frequently seen in ventricular extrasystolia of the irregular type, as *not* due to induced blockage in the bundle, however otherwise it may be explained.

Paroxysmal Tachycardia in a Boy, aged 4½.

By Percy Kidd, M.D.

P. G., aged 4½, was admitted under my care into the London Hospital on March 13, 1905, on account of vomiting which had occurred frequently for some time.

Previous diseases: Whooping-cough and measles. Since he had measles at the age of 2 he had been liable to a kind of fit, in which he goes stiff and turns rather blue, but lies still and does not twitch or scream. These fits, which last a few minutes, recur about once a month. In June, 1903, he had a bad attack of vomiting which lasted ten days.

He has always been subject to cough. In 1904 he was admitted under Dr. Warner with a pulse of 240 after an attack of vomiting which lasted five days. The heart was dilated and the liver enlarged. The pulse fell to 96 in a few days, and he was discharged fairly well in three weeks.

The patient was a healthy-looking, well-developed boy, with a clear complexion. His mental attitude was peaceful and his temper was good. On admission the pulse was 150, respiration 30; the heart's apex beat was in the fifth space just within the left nipple line; the cardiac dullness began above at the third rib on the left side, and to the right reached almost to the right nipple line. The heart sounds were clear in all areas and no murmurs were audible. The liver was enlarged and extended down to within an inch of the umbilicus. The lungs were clear. The pulse varied from 240 to 80, though seldom below 120, except for a few hours, at the most for twelve hours on one or two occasions. The fall of the pulse-rate sometimes followed an attack of vomiting, a symptom which occurred very often. The drug treatment consisted in tincture of digitalis alone and the combined tinctures of digitalis and strophanthus and convallaria. In addition an ice-bag was frequently applied to the præcordia. As a rule the pulse-rate was uninfluenced by these measures, though occasionally a temporary fall in the rate was observed during this treatment. Almost invariably the boy looked well, his colour was healthy, and his spirits good. His blood contained 5,000,000 red corpuscles per cubic millimetre, and the hæmoglobin content was 50 per cent.

In September, six months after his admission, slight anasarca developed, the liver became further enlarged, and purpuric spots appeared on his legs. The condition of the heart remained unchanged, no murmur being heard to the end. On September 25 there was a sudden attack of dyspnœa and cyanosis with rapidly developed œdema, which terminated fatally the same day.

Post mortem: Heart, 6 oz., greatly dilated in all its chambers, especially the right ventricle, which contained much decolorized clot. Right ventricle, and to a less extent right auricle and left auricle, slightly hypertrophied. All valves normal. Mitral and tricuspid orifices dilated; no endocarditis. Foramen ovale closed. No abnormality of vessels. Kidneys lobulated and showed some depressed scars on the surface. Liver, 2 lb., enlarged and slightly nutmeg. Brain and membranes healthy. Cervical lymphatic glands slightly enlarged. Thymus large. Thyroid not unduly large. No signs of rickets.

Secondary or Symptomatic Leukæmia.

By Gordon R. Ward, M.D.

The division of anæmias into primary and secondary has long been practised and accepted. That a similar division of leukæmias may conveniently be made, it is the object of this paper to demonstrate. So far as the writer has been able to ascertain, no paper has been written from this point of view, although certain French authors have come very near to it (Dominici [13], Emile Weil [59]). As a consequence, much of the material to be presented in favour of this thesis has been derived from a perusal of reports of cases which were written from some other point of view, and from which particulars of value for the writer's purpose are frequently omitted in the most aggravating manner. The evidence should, therefore, be rather judged as a whole than criticized case by case.

What is ordinarily called leukæmia the writer would call primary leukæmia, and this may be regarded as a disease of which the chief clinical and pathological features reflect the response of the blood-forming organs to a stimulus of which the nature is unknown. It is convenient to suppose that this stimulus is produced by the excessive destruction of leucocytes within the body, just as after a sublethal dose of benzene the red cells are destroyed in the body, and their products give rise to a characteristically extensive and irregular reaction of those blood-forming organs which are concerned in the formation of red cells.

In leukæmia, then, and in response, as we more or less plausibly suppose — the point cannot be argued here — to excessive leucocyte destruction, the blood-forming organs show a great and irregular exaggeration of white cell formation. Nor is this confined to the marrow, glands and spleen—i.e., the normal blood-forming organs of the adult. The liver also takes a share, and after death we find in Glisson's capsule a by no means inconsiderable amount of tissue, which is morphologically (and presumably functionally) identical with that of the marrow or glands, as the case may be. In this condition of the liver we have one of the surest criteria of the presence of leukæmia. Further search will reveal similar growths in other organs, and in organs, moreover, which are not associated with blood formation even in fœtal life. In all these situations we must assume the presence of primitive cells, which are capable of forming blood cells under the influence of a sufficiently powerful stimulus. This assumption is supported by many facts which cannot be detailed here.

Now, for primary leukæmia we hypothecate the most powerful of all stimuli—viz., an excess of the products of leucocyte destruction, and consequently the resulting changes are better marked than in any other condition. Almost invariably, for example, there is so great a proliferation of white cells that the blood shows from five to fifty times the normal number of white cells. This, however, is not an essential of the disease; we know little or nothing of the mechanism by which the cells of the marrow are shed into the blood-stream, but clinical observation sufficiently attests that this is a very variable factor even in the individual case of leukæmia, and that the blood may in some cases or at some times be practically normal. Hence, although a "leukæmic blood-picture" is good evidence of the changes in the organs detailed above, its absence by no means excludes such changes.

It may be at once stated that in secondary leukæmia the full blood-picture of primary leukæmia is rarely met with, just as in the secondary hæmolytic anæmias—e.g., chronic benzene poisoning—the full, so-called "pernicious," blood-picture of Addisonian anæmia is not often met with.

Histologically, the secondary leukæmias fall naturally into two classes—viz., secondary lymphæmia and secondary myelæmia, these being the usual divisions also of primary leukæmia. The former seems to be especially associated with septic diseases, the latter with cancer.

Clinically—and here it must be admitted that much more information is necessary before anyone can venture to speak with assurance—it seems that we can recognize certain classes of cases more often associated with secondary leukæmia than others. Of course, in all these cases the leukæmia is purely a symptom, it is secondary to obvious or plausibly conjectured causes. Some of these classes can now be discussed, and mention will be made of the reasons for their inclusion and of apparently allied, but not certainly identifiable, cases.

SECONDARY LEUKÆMIA IN SEPTIC PROCESSES.

Cabot [8] has put on record four cases in which there was a blood-picture so similar to that of primary lymphæmia as to cause considerable misgiving to the attending physicians. Yet all these cases made a good recovery, and one at least was known to be well fifteen years later. In the latter case the lymphocytes reached 70 per cent. of all white cells.

It was that of a young physician, who infected his finger at an autopsy, and had thereafter swelling of the glands in the axilla of the same side, and later in the opposite axilla also. In the next case, one of persistent boils, the lymphocytes reached 86 per cent., and it is further noted that they were unlike the ordinary hæmic lymphocyte, in that they showed mitotic figures and other irregularities. One may legitimately attach some importance to this fact when a diagnosis of leukæmia as against lymphocytosis is under consideration. Cabot's other two cases were of a more doubtful type. The blood, indeed, was that of leukæmia, but the clinical signs seems to have been very indefinite, so that the diagnosis of primary leukæmia is not altogether excluded. In both, sore throat and enlargement of the glands were present. Dr. Braxton Hicks, of the Westminster Hospital, informs me that he has seen a similar case, and I remember also a case under the care of Dr. Gossage, in the same institution, which presented a lymphæmic blood-picture and swelling of the glands with a septic condition of the mouth. These cases all made a good recovery, and no autopsy was possible. The diagnosis must, therefore, rest on the blood condition and the fact that the glands were swollen, even those in no direct or indirect communication with any septic focus.

Lindsay Steven [53] reported a case of broncho-pneumonia in a child aged 1 year 10 months, in which the white cells reached 236,000 per cubic millimetre, of which 65 per cent. were mononuclears. They are referred to as lymphocytes, but W. K. Hunter, who examined some of the films, notes that some of them stained abnormally, so that we may assume that they were allied to the abnormal lymphocytes which one expects to meet with in leukæmia. The patient died, but the account of the autopsy is devoted to the condition of the lungs. Cabot also reports two cases of pneumonia in children, aged 1 year 3 months and 6 years respectively. Both seem also to have had pertussis. In the first the white cells reached 185,000, with 64 per cent. of lymphocytes, and in the second 94,000, with 66 per cent. of lymphocytes. A lymphocytosis is, of course, a common feature of pertussis, apart from the pneumonia (Meunier [39], Grulee and Phemister [21], Churchill [11], &c.). It may also be noted that high white cell counts, but with the polymorphs in excess, have often been met with in ordinary lobar pneumonia. Emerson [15] reports 105,000 white cells in a man aged 25, Cabot [10] 100,000 per cubic millimetre, Laehr [34] 115,000, and other authors similar figures. In none of the cases here quoted as secondary lymphæmia has there been an autopsy, nor has secondary lymphæmia any bad prognostic significance.

In secondary myelæmia associated with septic processes the data are more satisfactory. Austrian [2] reports a case of broncho-pneumonia with mastoiditis in a child aged 4, which proved fatal. The white cells reached 192,000, and the percentage of myelocytes was from 10 to 14 per cent. This is not a high percentage, but a little arithmetic shows that the total number of myelocytes per cubic millimetre was over 23,000. There was also a varying percentage of cells which could not be classified under any of the ordinary headings, and these were perhaps myeloblasts. The autopsy showed "marked hyperplasia" of the marrow, although there were "still some areas of fat remaining." The "large neutrophile myelocyte" was the predominant cell. The Malpighian bodies in the spleen were grey and "tremendously enlarged." The parenchyma of the liver was infiltrated with "mononuclear cells and occasional myelocytes." The bronchial and mediastinal glands were much enlarged. On these facts, especially the liver changes, the presence of a process to which the name leukæmia may properly be given seems established. Austrian, however, remarks categorically: "Leukæmia is definitely excluded by the history, by the physical findings, and by the necropsy." One may assume that he means that primary leukæmia is so excluded. This does not mean that he would necessarily exclude secondary leukæmia. This is the most complete case that I am able to bring forward in this class. Morawitz [40] records a case in which the patient was aged 16, and suffered from "a feverish malady of the heart without sequelæ." The white cell count was always low, but the myelocytes reached 15 per cent., and of these 1·5 per cent. were eosinophile myelocytes. Recovery was complete. Hirschfeld and Kothe [26] report a case of gangrenous appendicitis complicated by hæmorrhage from a duodenal ulcer in a boy, aged 10. The white cells reached 190,000 and the myelocytes 7 per cent. The highest total count of myelocytes recorded by him in this case is over 11,000 per cubic millimetre. The report is very short.

FRACTURES AND SECONDARY LEUKÆMIA.

The second class of cases, and one to which one draws attention with some diffidence, comprises those in which a fracture has been accompanied by peculiar blood changes. The classical case is that of Simon [51], in which an adult negro sustained a fracture of the ankle by having the leg crushed. On admission to hospital the blood showed merely a polymorph leucocytosis, but a week later the following changes were noted—viz., the wound was septic, the spleen was enlarged, and the blood showed 50,000 white cells, with 15 per cent. of neutrophile myelocytes, 1·2 per cent. of eosinophile myelocytes, and 17·5 per cent. of mast cell leucocytes. A week later, the leg having been amputated in the meantime, the blood was almost normal, and three months later was quite normal. Simon appears to have been at some pains to search the literature for similar findings, but with little result. He says, however: "Hastings writes me that in two cases he has seen myelæmia with myelocytes between 3 and 7 per cent., the one being a severe crush of the thigh and femur, and the other one of the forearm, with no break in the skin and no evidence of infection." Wiczkowski [61] records the case of a man, aged 24, who also sustained a crush of the ankle, and in whom the inguinal glands on the side of the crush were enlarged ten days later. Soon all the glands and the spleen were enlarged, and the white cells reached 590,000 per cubic millimetre. The patient died, but no autopsy was permitted. The case is reported because the author claims to have infected animals from an emulsion of a recently excised gland, and the ætiology and exact nature of the leukæmia are not discussed. It is a peculiar coincidence that Hirschfeld and Kothe [26] also report a case in which there was a fracture of the leg and a leucocytosis of 108,000, but no differential count is given. The patient was a girl, aged 16. Wonderful theories have been built up on less remarkable coincidences, but one cannot help feeling that sepsis was probably the important factor in these three cases, and in any case there is not sufficient evidence to incriminate the fractures *per se*. Simon's case was certainly septic, and so also was that of Hirschfeld and Kothe, while in Wiczkowski's case the foot was swollen, and although sepsis is not specifically mentioned the whole report is very short and incomplete.

CANCER AND SECONDARY LEUKÆMIA.

This paper is the outcome of an original intention to collect from the literature cases of myelo-phthisic anæmia. This term has been used to cover all cases in which the marrow was physically encroached upon by new growth, &c., and in which anæmia resulted. So soon, however, as one came to consider cases of cancer with metastases in the bones, it was apparent that the nature of the encroaching growth was of far more importance than the area of marrow which it was able to displace. It was also noted that there might be many cancer metastases or other growths in the marrow and yet no anæmia. Further examination of those cases in which blood changes did occur showed that there was a very distinct parallel with myelæmia. This was obviously not primary myelæmia, and was therefore thought of under the provisional title of secondary myelæmia. This soon brought to mind cases such as those already noted, and the conception of secondary leukæmia took shape.

It must also be noted that primary leukæmia itself is regarded by some as a cancer and as having particular affinities with round-celled sarcoma. Some authors have even included cases of primary leukæmia in papers on cases of cancer with bone metastases, but all cases to which a suspicion of such a mistake—as the writer holds it—attaches have been excluded from the list of some thirty cases of cancer with bone metastases here considered. In some of these the evidence of secondary myelæmia is overwhelming, and two or three of these will alone be considered in any detail. It may be stated that they include only cases in which mention is made of the blood condition.

The first case has not yet been published. It is that of a woman, aged 47, who was under the care of Dr. Hutchison at the London Hospital. She was also seen by Dr. Parkes Weber. The pathological report will be published by Dr. Turnbull shortly. I am extremely indebted to these gentlemen for the kindness with which they have permitted me access to the records of the case, and especially to Dr. Turnbull, who has shown me all the sections and specimens connected with it. The patient died from cancer of the breast and during life was very anæmic. The white cells were 22,000 per cubic millimetre, and the myelocytes 8·5 per cent. It is of interest that a blood count of this kind, which might be paralleled from the records of all kinds of widely differing diseases, was nevertheless associated with extremely extensive myeloid changes in all the organs. At autopsy the marrow was found to be almost entirely replaced by cancerous infiltration, and the same was true of the spleen, the liver, many of the glands, and the affected breast. The other breast was free from cancer, but nevertheless showed considerable areas of tissue which was composed of cells such as are met with in the marrow. Such tissue was also found about the cancer growths in other organs. It contained not only neutrophile and eosinophile myelocytes, but also foci of red cell formation, in the centre of which were seen primitive nucleated red cells, and at the periphery those more fully formed. The red cells in the blood also showed the changes which one meets with in primary myelæmia. Nevertheless, there were still some fatty areas in the marrow itself.

The case of Kurpjuweit [32] was very similar. The patient was a woman, aged 34. The primary disease was in the stomach. The liver, spleen and some of the glands showed myeloid transformation. The blood showed 11 per cent. of myelocytes, but the total number of white cells was not increased.

In the case of Kast [31], a man with carcinoma of the penis of eighteen months' duration, the spleen was myeloid and contained Charcot-Leyden crystals, the marrow contained the same crystals. The liver does not seem to have been examined microscopically, but it is noted in connexion with the glands that those which did not contain cancer were myeloid. The white cell count was rather remarkable, the numbers reaching 120,000 per cubic millimetre, but the myelocytes were only 1 per cent. These three cases are typical examples of secondary myelæmia.

It may be noted that Shoemaker [50] records a high count in a case of cancer of the stomach, the white cells reaching 125,000 per cubic millimetre, but gives no differential count, nor does he seem to have examined the bones after death. Austrian [2] quotes von Limbeck as recording a case of multiple cancer with 120,000 white cells per cubic millimetre, but I cannot find the account which seems to be referred to in von Limbeck's book. Cabot [9] records a case of cancer of the peritoneum in which the kidney and spleen were affected, and in which the white cells reached 152,000, but with these exceptions one has not been able to find any very high counts in cancer.

Mercury Poisoning and Secondary Leukæmia.

There are two cases of interest in this connexion, and they are brought forward here because of the simple nature of the presumed cause of the leukæmia. They are very incomplete. Moulinier [41] reports the case of a man who took an unknown but considerable quantity of bichloride of mercury. He died fifteen days later, and at autopsy the spleen was found to show "complete myeloid and erythroblastic transformation." There were no blood counts or further microscopical examination, but the writer mentions that there were many nucleated red cells in the sinuses of the spleen—if one may so interpret his phrase, "des lacs sanguins sans parois propres."

Beck [4], in another case of mercury poisoning, records that the spleen was enlarged and of soft consistence with opaque follicles. The blood showed myelocytes. Such cases might well form the inspiration of some useful research work.

OTHER CASES OF SECONDARY LEUKÆMIA.

Emile Weil [59] investigated cases of variola before suppuration had set in and found remarkable changes in the blood which were of short duration, being soon displaced by the usual polynuclear leucocytosis. He remarks apropos of the blood-picture: "En même temps co-existe toute la série des formes leucocytaires qu'on peut voir dans la leucémie myélogène." He also finds nucleated red cells but rarely, except in the hæmorrhagic form. He claims that he is the first to describe this "syndrome." Courmont and Montagard [12] covered the same ground and agreed with his "leukæmic" finding.

Labbé and Delille [33] record a case of hereditary syphilis in a child, aged 1 month, with enlarged spleen. The white cell count was increased and the mononuclears were altogether 85 per cent. Of these, 50 per cent. were large mononuclears. In the discussion which followed his communication several speakers emphasized the fact that this "anémie pseudo-leucémique" was only a symptom and not a disease and might be met with in syphilis, rickets, tuberculosis, and intestinal infections. Dominici [13] carried out some experiments on dogs with the idea of producing myeloid changes, and seems to have been very successful in experimental tuberculosis, typhoid, sepsis, and potash poisoning. He remarks that the hæmopoietic organs react as a whole to these poisons but does not bring the changes into comparison with those of primary leukæmia.

Dr. Turnbull informs me that he has always taught that the splenic anæmia of infancy described by von Jaksch was a myeloid leukæmia, and very kindly showed me slides from several cases which certainly seem very strongly to support that contention.

As already explained, it was the original intention of this paper to deal with cases of cancer with bone metastases as examples of myelophthisic anæmia. For this purpose a considerable number of cases had been collected from the literature before it appeared better to consider them from a different point of view—viz., as examples of secondary leukæmia. The accompanying table gives the results of blood examinations in thirty-six cases of cancer in which marrow metastases were found post mortem. Only a certain number of these can be cited as examples of secondary leukæmia, and some did not even show anæmia of any kind; but on the whole, one cannot help remarking that this is a very extraordinary series of blood counts and one not to be paralleled from the records of cancer without such metastases, or of any other disease. The examination of the spleen, marrow, &c., in this series of cases is not always recorded, but when this is the case frequently gives valuable evidence of some degree of that process to which the writer would give the name secondary leukæmia. Three cases (those of Turnbull, Kurpjuweit [32] and Kast [31]) have already been referred to.

In three of these cases the red cell count was below one million, the lowest being 681,000 per cubic millimetre (Frese [19], Kurpjuweit [32]). Some of these low counts have depended in part at least on the presence of hæmorrhage during life (Houston [27], Harrington and Teacher [23], Turnbull, &c.), but in this lowest of all there is no mention of hæmorrhages except those in the retina. As in his other case Frese mentions that hæmorrhages were profuse during life there is no reason to suppose that he would not have done the same in this also had it been the fact. It may be noted that retinal hæmorrhages are mentioned in four cases out of the thirty-six. There are fifteen cases in which the red cells touched under two million per cubic millimetre—i.e., half of the cases in which the red cell count is recorded. This would not be the case in cancer without metastases. In Price-Jones's [45] thirty unselected cases only two showed counts below 2,000,000 per cubic millimetre. In many of the cases here detailed the blood-picture associated with Addisonian anæmia was very closely simulated, there being a colour index above unity in no fewer than seventeen cases, megaloblasts in at least thirteen cases, and poikilocytosis in most of those in which the point is referred to.

The blood-picture, so far as the red cells are concerned, seems to the writer to conform to one of three types, viz.:—

(*a*) Severe anæmia with relatively few nucleated red cells but many poikilocytes, abnormalities of staining, &c.—i.e., the so-called "pernicious" type. To this belong Cases 3, 4, 10, 12, 13 and 28 in particular (fig. 1). Probably the case of Epstein, not in this table, belongs here, as does that of Ehrlich, Case 35, in which no exact numbers are given.

(*b*) A type in which the large numbers of nucleated red cells seem to be the most remarkable feature. In this respect the blood condition approaches that seen in primary myelæmia and is uncommon in any other condition. Thus Wolfer found 29,000 nucleated red cells per cubic millimetre and the writer has met with 16,000. In my own case only about 2 per cent. were megaloblasts, and there was only one count of the six made which showed so many nucleated cells. In the other counts, however, the numbers were still from 3,000 to 5,000. Cases 5, 6 and 14 show counts of over 1,000, and Case 16 over 4,000 nucleated red cells per cubic millimetre (fig. 2). Several authors mention the presence of nucleated red cells without further specification.

(*c*) A type in which the blood is practically normal, or the red cell count even abnormally high. Price-Jones [45] records 6,390,000 red cells, with 95 per cent. of hæmaglobin, but even here there were some nucleated red cells. In two cases the writer has seen over 5,000,000, but in neither were there any nucleated red cells at that time. It must, of course, be admitted that many causes productive of a secondary polycythæmia may be in operation in cancer cases.

Since the mere recital of figures is a somewhat unsatisfactory method of conveying a graphic picture of the blood condition, the writer has devised a method, of which illustrations are given. This aims at giving in a diagram some idea of what one might expect to see in any one field under the microscope. The three types mentioned are thus set forth :—

The exact method of making a diagram is as follows: For every 100,000 red cells per cubic millimetre one is depicted in the diagram. For every 100 nucleated red cells one is depicted. If poikilocytosis is noted as "present," one-tenth of the cells in the diagram are represented as poikilocytes, if as "marked" or "many" then one-third, if as "extreme," "very marked," &c., then two-thirds. Megalocytes are represented on the same principle, and if desired polychromatophilia can also be indicated. If more than one nucleated red cell is to be shown (as in Case 14 for example), these are depicted as megaloblasts or normoblasts, according to the relative numbers of the two varieties in the original films.

It is naturally from a consideration of the white cells that we shall expect to derive indications of the presence of secondary leukæmia, but as has already been pointed out, the presence of only a few myelocytes in the blood is no proof that there is not a most extensive myeloid change in the organs (vide Turnbull's case). Of thirty cases in which the differential blood count is referred to, no fewer than twenty-four showed myelocytes. The highest percentages were 31·3 per cent. in a case of the writer's, 17 per cent. in a case of Kurpjuweit [32], and 18·7 per cent. in a case of Frese [19]. In two of these eosinophile myelocytes were present, while the other (Frese [19]) showed nc less than 11·7 per cent. of myeloblasts. Altogether seven cases showed above 10 per cent. of myelocytes. At least six cases showed myeloblasts. It is occasionally stated that cancer of bone gives rise to eosinophilia, but this series shows no eosinophile count above 4·8 per cent. The total number of white cells is very variable, in twelve cases it was below 10,000—i.e., there was no leucocytosis. The highest number of white cells was 120,000 per cubic millimetre in the case of Kast [31] already referred to. Generally speaking, the total numbers of the white cells are not high—on the whole they agree very well with the counts in Price-Jones's [45] thirty cases.

Other evidences of secondary leukæmia are to be found in the organs, but the reports have very frequently proved useless as regards details, hence the material available for this purpose is small.

The marrow has differed very widely—sometimes it is almost absent from its usual sites, its place being taken by tumour masses or fibrous tissue. Where smaller masses of tumour have been noted lying amongst the cell-forming marrow, some reaction of the latter is often obvious. It was, however, absent in the case of Parmentier and Chairol [43], judging from the illustration they give, and was very slight in one of the writer's cases. This reaction may take various forms; most frequently the growth is surrounded by hæmorrhage, less often the marrow formation seems to have been inhibited in the neighbourhood of growths. In others, and perhaps the majority of the cases, the marrow shows the changes one would expect from the condition of the blood, but it is not clear that the presence of cancer determines any particular change in its immediate neighbourhood. In Turnbull's case, however, there was evidence in various parts of the body that the cancer growth had influenced the surrounding tissues in the direction of causing them to develop myeloid cells.

The spleen is mentioned in seventeen cases, and in twelve of these it was enlarged. Parmentier and Chabrol [43] are inclined to make splenomegaly one of the chief diagnostic points of the presence of bone metastases in cancer. It may be noted that sundry investigators—e.g., Price-Jones [44], Medigreceanu [38], &c., working on the transmission of cancer to mice, have noted that the spleen is usually enlarged to a considerable extent. The normal mouse spleen is a myeloid organ, so that the enlargement is of some interest in connexion with the myeloid spleens, which are associated with some of the cases here recorded. Of seven cases in which the spleen seems to have been examined microscopically six showed definite myeloid changes. It is true, of course, that the number of cases is small, but, on the other hand, the proportion is large, as was also the myeloid change extensive.

The liver has been less carefully examined than the spleen.

Houston [27] found "an indefinite iron reaction;" Turnbull found it extensively myeloid, Parmentier and Chabrol [43] seem to have found it enlarged, but merely state that it was fatty and had no growth. Kurpjuweit [32] found myeloid reaction, &c. One can only state that there is no evidence of much value except that of myeloid changes in two cases. The liver was more often the site of extensive growth than not.

The glands have been noted as enlarged in most cases, but microscopical examination has not been frequently reported. Turnbull found some myeloid glands, as did Kurpjuweit [32] and Kast [31], but all other notes deal only with the presence or absence of growth. Nevertheless, the presence of myeloid changes in the lymph glands of as many as three cases is a very noteworthy feature.

Other tissues are only noted as the site of myeloid growth in Turnbull's case. Such cases would be comparable to the "nodular" [56] variety of primary leukæmia—i.e., the clinical variety in which growths are found in the skin, &c. (i.e., in places where normally lymphoid tissue is not found). Again, this finding, although standing alone at present, is very strong evidence in favour of the identification of the process which it exemplified with primary leukæmia.

A few other signs or symptoms met with in leukæmia have been met with. Thus, in Parkes Weber's case the appearance of the retina from the description seems to have been very similar to that of leukæmic retinitis. Boggs and Guthrie [6] found in their case the Bence-Jones body in the urine, and this they have also found in three cases of leukæmia. It has also been found by other authors in leukæmia (Weinberger [60]). Several authors in this series, however, specifically exclude Bence-Jones proteinuria. In Kast's [31] case Charcot-Leyden crystals were noted in the spleen and marrow. These are isolated, but interesting, findings.

Details of cases are to be found in the appended tables and in the original papers referred to. It has been possible to include some cases in the tables of which mention has not been made in the paper—this is not to be understood to imply that they are necessarily of comparatively small importance, the fact being that the writer has continued to search the literature as occasion offered since this paper took its present shape, and has found it impracticable to incorporate all the new material except in the form of tables.

CONCLUSIONS.

What conclusions can be legitimately drawn from the material here presented, material which, so far as the writer has been able to ascertain, has never been previously collected with the idea of sustaining such a thesis as is implied in the title to this paper—viz., the existence of a secondary leukæmia comparable to secondary anæmia, in that both own (in many, but not necessarily all cases) some obvious ætiological factor, and are defined with sufficient clearness to prevent their confusion with what have long been designated primary anæmias, and with what one may now call, without fear of misunderstanding, the primary leukæmias ?

It is obviously not for the writer to judge whether his thesis is sustained, or rather one should say his theory, for a thesis is an arguable hypothesis existing apparently for the purpose of being argued about, but a theory is an arguable hypothesis existing for the purpose of use as a substructure to as yet unattained information. The proof resides in the cases which have been referred to; they are here presented in a very much abbreviated, and to that extent biased, manner, but the full reports are open to any interested person. It has not, however, appeared to the writer that there is anything in any of these reports to invalidate the suggestions he makes, with the sole exception of the remark made by the Austrian on his case, which remark has been quoted in full. Apart, however, from the facts adduced, there are theoretical reasons which should lead one to expect a secondary leukæmic process to occur.

Leukæmia may be considered as strictly comparable to Addisonian, so-called "pernicious," anæmia. The latter, undoubtedly, represents the reaction of the blood-forming tissues to destruction within the body of red blood cells. Its blood-picture (poikilocytosis in an extreme form, high colour index, nucleated red cells, &c.) has frequently been produced by poisons which are known to have as one of their properties the destruction of red cells, and this destruction is, moreover, obvious in the blood-stream before the "pernicious" blood-picture develops. Of recent years the progress of Addisonian anæmia, or at least of allied anæmias with a similar blood-picture, has been materially modified by the removal of the spleen—an organ which the researches of Hunter [29], Banti [3], Gilbert and Chabrol [20], and others has shown to be essential to the full development of hæmolysis after the administration of an admitted blood poison. There is then a type of blood-picture which is usually associated with extreme precedent hæmolysis in the body. In Addisonian anæmia it is commonly supposed that the hæmolytic agent is bacterial, but proof is wanting in any generally accepted form.

The writer *provisionally* accepts the hypothesis that the primary leukæmias are strictly comparable to Addisonian anæmia—that they are probably the reaction of the blood-forming organs to excessive destruction of white cells within the body and in all probability of bacterial origin.

Now as a hæmolytic type of anæmia may be found but rarely, and in most cases to a much less extent, in other processes than that to which the name of Addisonian anæmia was given by William Hunter, so also leukæmias, similarly rare and undeveloped, are to be met with. These are the cases with which this paper deals. It will be noted that in both cases there is an increased and not a diminished activity of the hæmopoietic organs.

There is, on the other hand, a type of anæmia in which the marrow activity is diminished—the not infrequently described cases of acute aplastic anæmia with a fatty marrow are examples of this. They are paralleled in the white cell series by the leucopenia with which they are accompanied, and probably also by that of the leucopenia in many other diseases. These are all leucopenias in which the marrow cells are diminished: there seems to be no exact parallel in reduction of the lymphoctye series.

A further type of anæmia is that which follows blood loss—i.e., external hæmorrhage. This would seem to be paralleled by the leucocytosis which accompanies it. The reaction to blood loss is, in either case, an increase in the activity of the marrow, and not a decrease, as the term "anæmia" might allow one to suppose. It is of interest that chronic and repeated blood loss "exhausts" the marrow, and with it the leucocytosis which gives way to a leucopenia.

Inflammatory leucocytosis the writer would suppose to be comparable to secondary polycythæmia — both probably depending on a biochemical process of which we know nothing. Both are capable of being invoked by comparatively simple bodies—e.g., phosphorus, carbon monoxide. The fact that secondary polycythæmia is a comparatively unimportant clinical feature and leucocytosis the opposite need not invalidate the suggestion that they are similar reactions in their essential nature.

The extreme polycythæmia of erythræmia is perhaps comparable to myelomatosis or Kahler's disease in the white cell series. Ribbert's [46] case of erythroblastoma needs verification, but if established would destroy this parallel. It may be mentioned that, although the abnormal cells of myelomatosis do not gain access to the blood-stream as such, the enormous output of the Bence-Jones body in the urine suggests very strongly that the degree of proliferation differs in its manifestation and not in its extent from that seen amongst the red cells in erythræmia.

The above suggestions are not presented with the weight of evidence or length of discussion which they deserve, but the writer certainly feels that a comparison of the reactions of the red and white cell tissues (and perhaps of other tissues also) to different agents affords evidence in favour of the existence of a secondary leukæmia—evidence of a purely theoretical nature.

Taking the facts and the theory together, the writer makes the following suggestions, in which, so far as he can discover, he has not been anticipated by any other writer, although certain authors—e.g., Erb [18], Ziegler and Jochmann [63], Eppenstein [16], Huber [28], Strauch [54], Turck [55], Dominici [13], Weil [59], &c.—seem to have approached but not comprehended his point of view, viz.:—

(1) That leukæmia may properly be divided into primary (or idiopathic) and secondary or symptomatic.

(2) That secondary leukæmia may be either lymphatic or myeloid in structure and is seldom if ever as pronounced in its histological features as the primary form.

(3) That secondary leukæmia is comparable to secondary hæmolytic anæmia—i.e., to the form of anæmia which follows blood destruction in the body. It exists, as this does, but rarely in extreme forms and quite commonly in lesser degrees.

(4) The study of cases of cancer with bone metastases shows that the two are by no means infrequently found in conjunction in this disease.

(5) That the division of leukæmias into primary (or idiopathic) and secondary or symptomatic is a necessary expedient at the present time, although subsequent research may be expected to show that all leukæmias are dependent on ascertainable causes and are in that sense secondary.

APPENDIX.

Previously unpublished cases of cancer with bone metastases :—

Case I.—Dr. Parkes Weber has kindly given me permission to make use of and to publish this case. K. M., aged 32. No previous illness, one child alive and well. Present illness of five months' duration and commenced with weakness and vomiting after food. Five weeks ago had pain radiating to the back and right shoulder. Three weeks ago noticed jaundice. No diarrhœa. On admission to hospital was anæmic and of a bright yellow colour. The spleen and liver appeared enlarged, but were not distinctly felt. No pain or tenderness anywhere. Slight ascites. Pulse 116. Apical systolic bruit. Lungs, *nil*. No enlarged glands. Gums bleed easily. Urine: Specific gravity, 1023, marked Gmelin's reaction. No special indican. Trace of albumin. Four days later jaundice seemed less bright. Some diarrhœa. Temperature has been raised to about 100° F. on several occasions. The optic nerves were not affected. The right retina showed two whitish, slightly raised plaques which were bordered by red hæmorrhage. There were four or five other plaques with no hæmorrhage and partly covering the retinal vessels. Vessels normal. Left retina similar to right but no hæmorrhage. On the next day œdema of the bases of lungs and of the legs was noted. Patient died three days later. The fæces were acholic throughout her stay in hospital.

Autopsy (Dr. Parkes Weber): Brain not examined. Heart, 9 oz., nothing special. A little bile-stained fluid in left pleura. Lungs negative except old quiescent tuberculosis at right apex. Liver, 94 oz., full of umbilicated new growths. Complete obstruction of bile-ducts about hilum. Stomach dilated. Pylorus surrounded by new growth, but mucous membrane little, if at all, affected. Spleen weighed 7 oz. and was soft and of a creamy red colour. Both suprarenals seemed to be occupied with some whitish new growth, but the kidneys presented no naked-eye abnormality. Many retroperitoneal and other intra-abdominal glands showed invasion by new growth. Left humerus sawn through longitudinally to show the bone-marrow of the shaft, which was practically replaced by innumerable small nodules of new growth separated from each other by red marrow—i.e., red metaplasia.

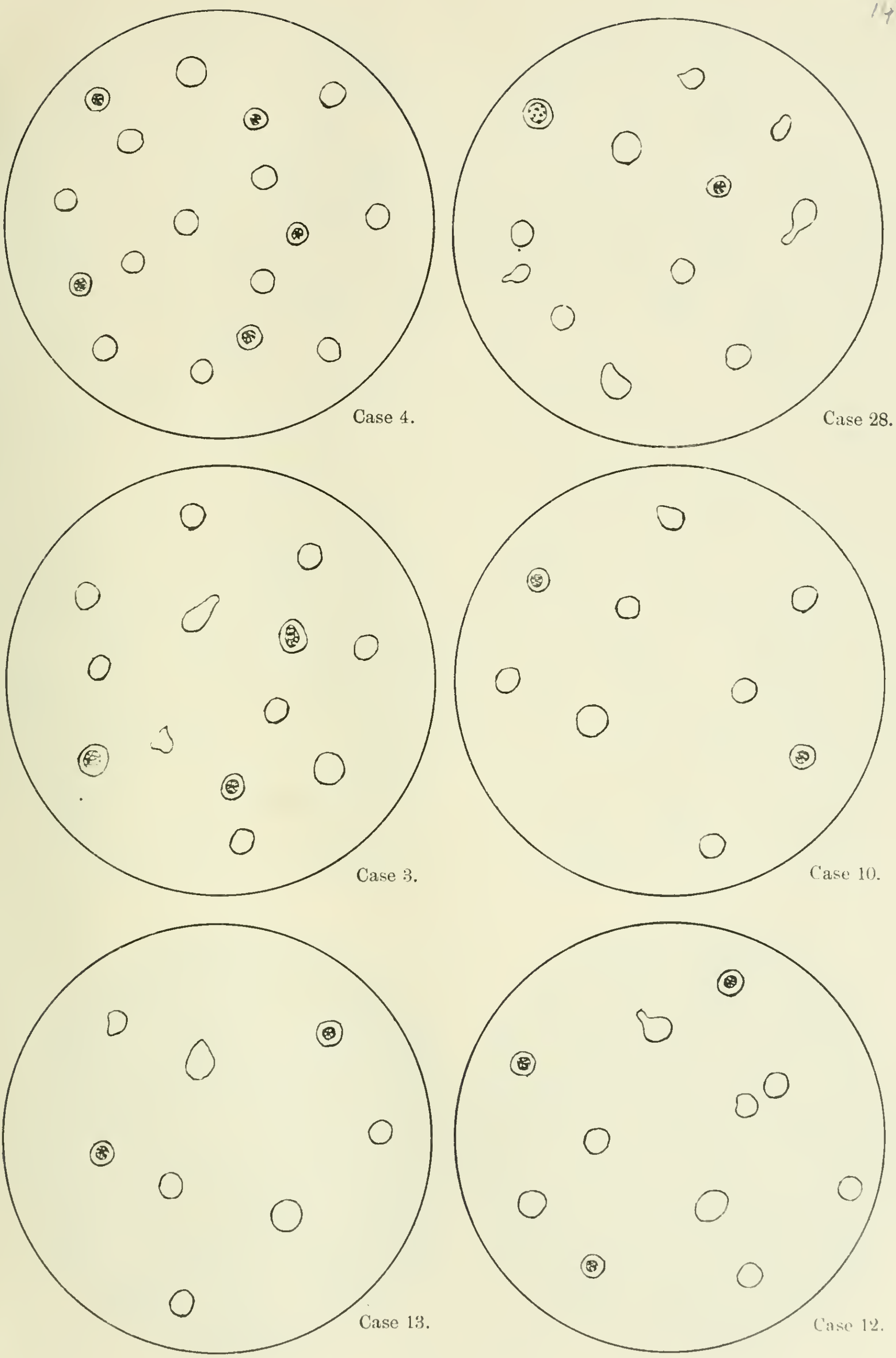
Histology: Pylorus shows typical carcinoma. No hepatic cirrhosis nor myeloid transformation. Much new growth. Some of the vessels were filled with cancer thrombi and some apparently with organizing blood-clot. Spleen (two pieces cut) showed no myeloid transformation nor infiltration nor nucleated red cells. Ovaries and other tissues showed malignant growth. Marrow from humerus showed carcinoma metastases and red marrow free from fat cells; this was from the shaft of the bone. Blood from the heart showed a good many nucleated red cells.

Case II.—Under the care of Mr. Tubby at the Westminster Hospital. I am indebted to him for permission to publish it. The first three blood examinations are reported by the kindness of Dr. Hebb and were made by the clinical clerk in his laboratory. The latter three examinations are by the writer. Unfortunately the clinical notes of the case are lost and no autopsy was possible. F. S., aged 39. Breast amputated and glands in axilla removed for spheroidal-celled carcinoma. Readmitted to hospital some months later. She appeared anæmic and slightly yellowish, but to the best of the writer's recollection had no other marked signs. The diagnosis of bone metastases was suggested, but not, I believe, on account of the blood changes. Certainly the blood examinations made at this time were not filed amongst other cases under cancer, but under myelæmiá. Nothing is known of the further history of the patient.

Case III.—E. H., aged 51, under the care of Dr. Court in the Chesterfield Hospital, to whom I am indebted for permission to publish it. Autopsy and blood examination by writer. For somewhat less than two months the patient had suffered from "rheumatism"—i.e., pain in the bones and back. This did not yield to any of the usual remedies, and it was soon apparent that the diagnosis was less satisfactory than usual. Admitted to hospital with no other signs except the pain in the bones, which was extremely severe before death. Nervous system normal, no enlargement of glands, spleen, or liver, thoracic viscera apparently normal. A few days before death he was troubled with vomiting for the first time, the vomited matter containing nothing abnormal. He had also mental symptoms, being confused, and not appearing to appreciate the nature of his surroundings. Before death he was in a condition similar to that of Addison's disease, except that there was no pigmentation. · The pulse was small, frequent, and of low tension, and there was persistent vomiting, restlessness, and mental symptoms.

Autopsy: Skull not examined. Large growth pressing on pancreas, but not involving it or the stomach and appearing to arise in the abdominal or retroperitoneal glands. The semilunar ganglia were not found, being involved in the new growth, but the adrenals were normal. Metastases in liver, lungs, and a few glands about the pancreas. Also in all the vertebræ, ribs and sternum. Lower end of femora and upper of tibia showed only fatty marrow, with the slightest trace of red marrow in one femur. The metastases were in many cases surrounded by areas of hæmorrhage.

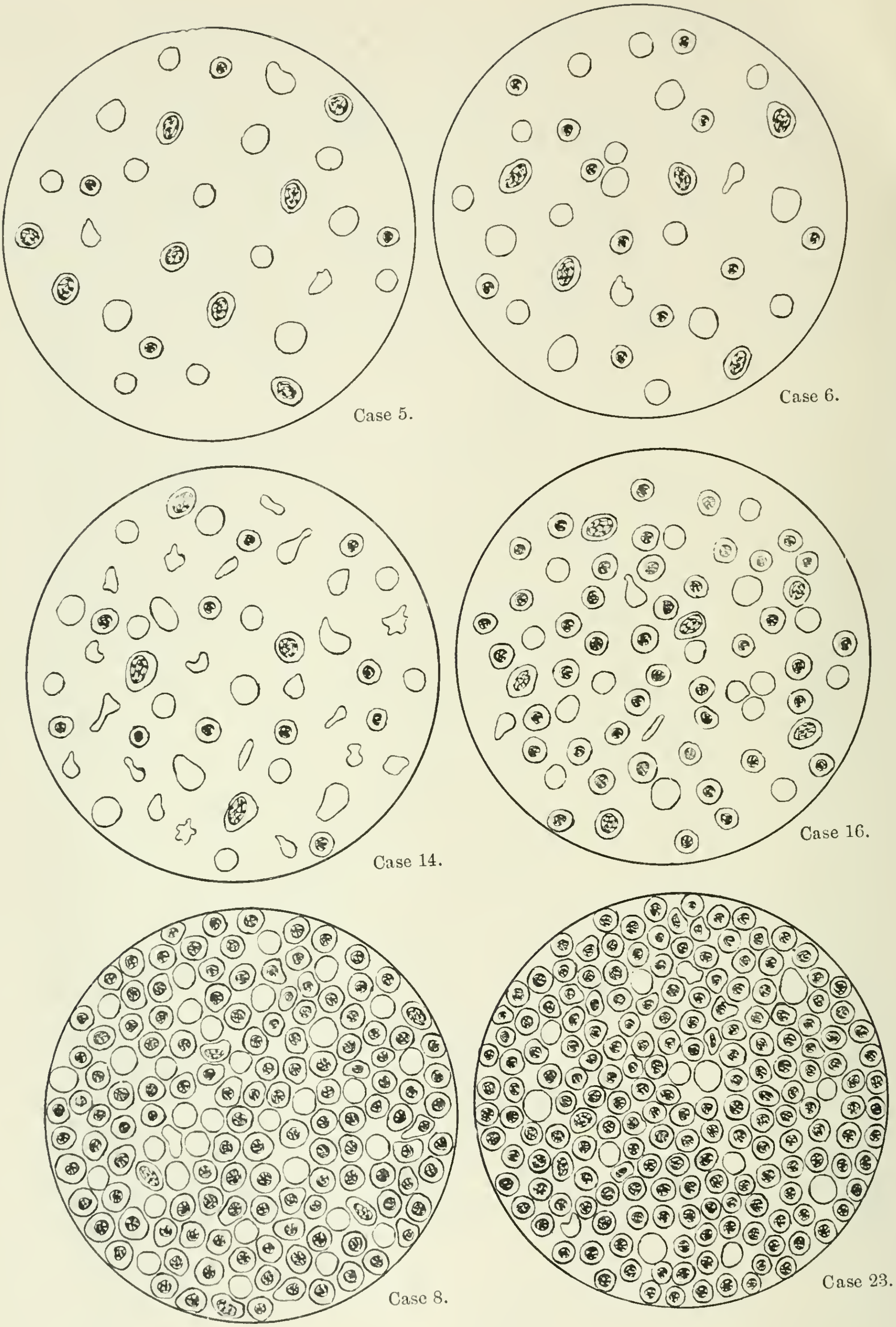
History: The primary growth is a spindle-celled sarcoma. The liver contains secondary growths but no myeloid infiltration or other alteration. The marrow shows the presence of metastases in part surrounded by hæmorrhage, but not otherwise affecting the marrow tissue proper. There is little or no fibrosis. There is possibly a slight excess of nucleated red cells and of small giant cells, but this may be a local variation as only one piece of marrow was affected.



Case 4. Case 28. Case 3. Case 10. Case 13. Case 12.

FIG. 1.

Cancer with bone metastases. Diagrams of blood examinations in cases showing severe anæmia.



Case 5.

Case 6.

Case 14.

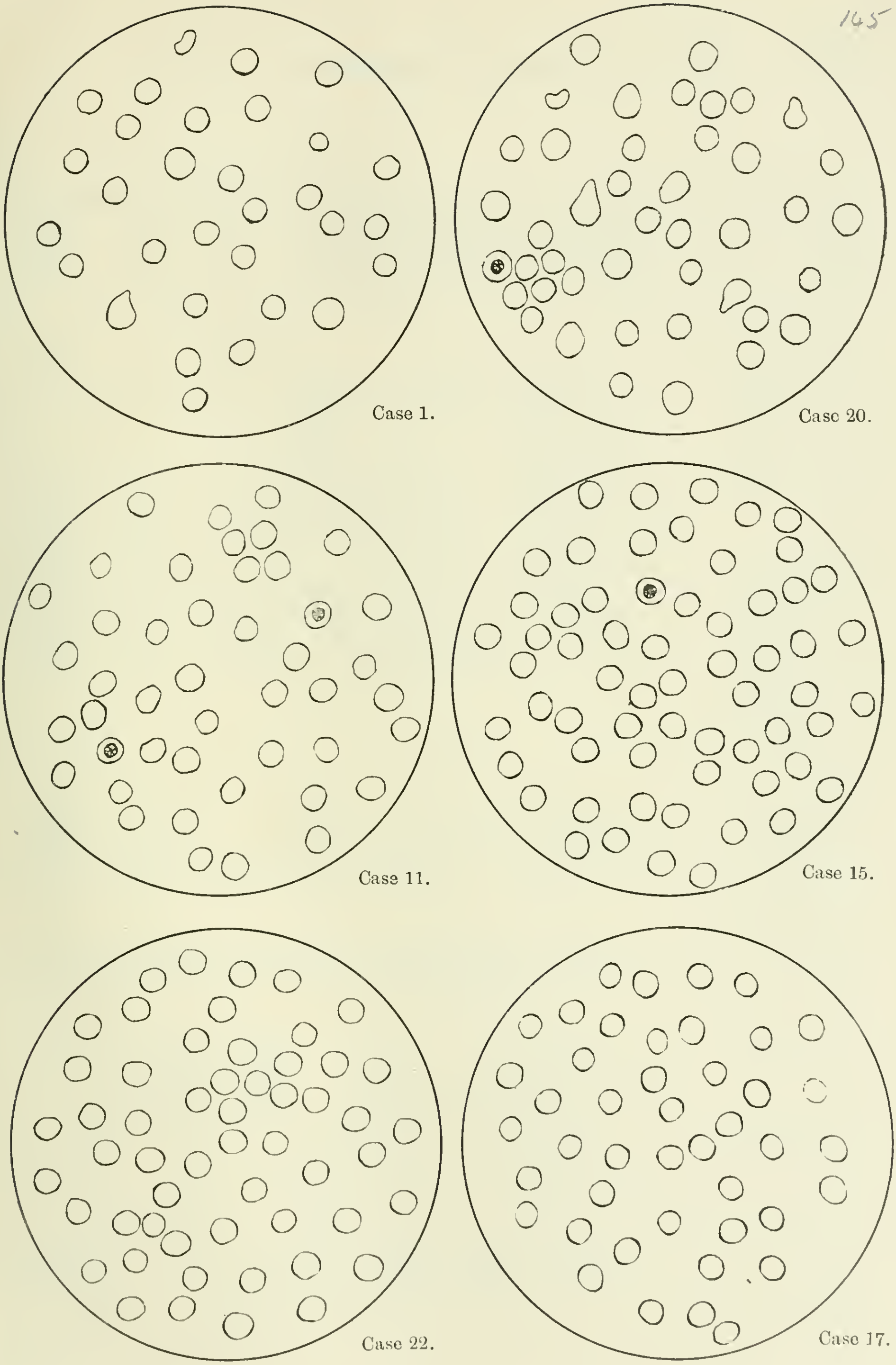
Case 16.

Case 8.

Case 23.

Fig. 2.

Cancer with bone metastases. Diagrams of blood examinations in cases showing excess of nucleated red cells.



Case 1.

Case 20.

Case 11.

Case 15.

Case 22.

Case 17.

Fig. 3.

Cancer with bone metastases. Diagrams of blood examinations in cases showing little or no anæmia.

TABLE OF BLOOD EXAMINATIONS IN CASES

Case	Author	Age	Day of observation	Red cells per cubic millimetre	Nucleated red cells per cubic millimetre	Normoblasts to megaloblasts	Colour index	Megalocytes	Poikilocytes	Poly-chromasia
1	Hawley [24]	55	1	3,172,000	One seen	—	1·2	A few	A few	None
2	Harrington and Kennedy [22]	52	1	2,751,000	One seen	—	1·12	Many	Moderate	Slight
			6	2,325,000	Two seen	0:2	1·304	—	—	—
			10	3,000,000	—	—	1·03	Fewer	—	—
			14	2,610,000	—	—	1·307	—	—	—
			18	2,525,000	—	—	1·12	—	—	—
3	Houston [27]	42	1	2,300.000	603	16:29	1·06	Many	Many	Present
			22	1,600,000	480	27:13	1·03	Many	Many	Present
			59	1,070,000	88	6:2	1·38	Many	Many	Present
			289	1,000.000	270	8:10	1·28	Many	Many	Present
4	Parkes Weber	32	1	1,056,000	204	100:0	—	—	Moderate	None
			6	1,248,000	446	—	1·25	Few	None	Marked
5	Harrington and Teacher [23]	64	1	1,600,000	924	4:29	1·09	Many	Moderate	Marked
			9	1,900,000	1,056	1:5	1·1	Many	Few	Marked
			17	1,800,000	1,120	5:9	0·9	Many	Few	Marked
			22	—	Present	10:23	—	Many	Few	Marked
6	Parmentier and Chabrol [43]	45	1	1,940,000	1,540	2:1	1·57	Many	Present	Present
7	Epstein [17]	—	1	—	Many	—	—	—	—	—
8	Wolfer [62]	37	1	1,550,000	25,900	—	0·483	Many	Present	—
9	Kurpjuweit [32]	51	1	3,250,000	Present	—	0·801	—	Few	Slight
			15	3,200,000	Present	17:7	0·781	—	Few	Slight
10	Kurpjuweit [32]	34	1	1,825,000	91	—	0·694	None	None	None
			10	718,000	177	10:1	1·42	Some	None	None
11	Kurpjuweit [32]	42	1	4,320,000	147	100:0	0·697	—	—	—
12	Frese [19]	26	1	2,400,000	None	—	0·937	None	None	None
			36	800,000	Many	100:0	0·812	—	—	—
13	Frese [19]	28	1	900,000	Moderate	100:0	1·16	Many	Moderate	Present
			13	681,000	Moderate	—	0·915	—	—	—
14	Price-Jones [45]	58	1	4,420,000	—	—	—	A few	A few	—
			6	3,760,000	—	—	—	Many	A few	—
			20	4,040,000	—	—	—	Many	A few	—
			38	4,450,000	180	100:0	—	Many	Many	—
			49	3,800,000	1,482	13:6	—	Many	Extreme	—
15	Price-Jones [45]	63	1	4,270,000	36	100:0	1·07	—	—	—
			8	4,490,000	—	—	1·08	—	—	—
			15	4,870,000	—	—	0·98	—	—	—
			29	6,390,000	72	100:0	0·75	—	—	—
16	Schleip [49]	33	1	—	—	—	—	—	—	—
			17	2,944,000	—	—	0·689	—	Present	—
			42	2,328,000	Few	100:0	0·869	—	—	Frequent
			48	1,984,000	Present	2:1	1·05	—	—	—
			49	—	4,860	14:3	—	Present	—	Marked

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* These figures include

OF CANCER WITH BONE METASTASES.

Hæmoglobin per cent.	White cells per cubic millimetre	Polymorpho-nuclears	Eosinophiles	Mast cells	Transitionals	Small mono-nuclears	Large mono-nuclears	Neutrophile myelocytes	Eosinophile myelocytes	Myeloblasts	Complicating hæmorrhages
75	7,300	63·0	None	—	—	27·0	10·0	None	—	—	No
62	2,500	56·4	1·6	None	14·0	19·6	4·8	1·2	—	2·4	No
60	3,750	68·5	1·0	1·5	12·0	10·5	4·0	0·5	—	2·0	—
62	6,770	64·8	0·8	None	9·2	19·2	2·4	2·8	—	0·8	—
68	4,000	78·6	0·2	0·2	7·6	6·6	3·0	1·6	—	2·2	—
56	10,000	91·0	None	None	4·8	1·2	1·8	1·0	—	0·2	—
49	6,700	54·0	0·6	—	0·8	36·2	8·4	—	—	—	Yes
33	6,000	56·4	—	—	3·0	38·3	2·2	—	—	—	—
27·6	5,500	67·2	—	—	0·4	30·4	2·0	—	—	—	—
25·6	7,500	53·4	0·8	—	0·8	43·4	0·4	1·2	—	—	—
—	10,200	78·0	1·5	—	—	11·0	8·0	1·5	—	—	Slight
30	18,600	63·2	None	0·2	1·4	14·4	9·4	11·4	—	—	—
35	14,000	63·0	0·7	—	18·8*	16·7	—	0·8	—	Present	Yes
42	8,000	52·2	0·6	0·2	28·2*	13·8	—	5·0	—	Present	—
35	8,000	59·0	0·1	—	25·5*	13·5	—	1·25	—	Present	—
—	—	54·6	0·8	—	21·4*	17·2	—	6·0	—	Present	—
60	3,500	60·0	4·0	—	—	21·0	6·0	8·0	—	0·6	No
19	1:25 to 1:40	—	Two seen	—	—	—	—	Many	—	—	—
15	20,000	66·0	—	—	2·5	22·0	5·5	4·0	—	—	—
53	22,700	62 5	2·0	—	12·0	23·5		Many	—	—	No
50	26,600	29·5	1·5	—	11·5	46·5		16·0	1·0	—	—
25	9,100	48·4	1·0	Present	8·2	19·2	12·2	11·0	—	—	Yes
20	6,700	42·5	1·2	1·0	10·5	21·7	15·3	8·7	—	—	—
60	19,700	86·1	0·7	—	—	6·2	3·0	4·0	—	—	Slight
45	8,740	—	—	—	—	—	—	—	—	—	Yes
13	20,000	Increased	Normal	—	—	—	—	None	—	—	—
21	9,220	64·5	1·0	0·5	11·0	15·0	—	8·0	—	—	No
12	10,150	—	—	—	—	—	—	—	—	—	—
—	12,830	70·6	1·5	0·5	4·1	23 2		—	—	—	—
—	10,500	70·2	1·1	0·5	5·3	22·7		—	—	—	—
—	12,000	73·1	4·8	0·4	6·8	15·2		—	—	—	—
—	9,000	70·0	1·9	0·5	13·1	14·3		—	—	—	—
—	19,100	85·0	0·2	None	4·1	10·5		—	—	—	—
90	9,000	60·0	1·0	0 6	7·2	30·6		—	—	—	—
95	12,600	67·0	0·3	0·3	7·7	21·5		—	—	—	—
95	9,000	61·5	0·2	0·2	8·5	29·5		—	—	—	—
95	12,500	69·0	0·5	1·3	3·5	25·1		—	—	—	—
—	7,200	—	—	—	—	—	—	—	—	—	—
40	8,000	—	—	—	—	—	—	—	—	—	—
40	12,600	—	—	—	—	—	—	—	—	—	—
40	16,400	82·0	1·2	—	2·9	8·2	—	0·8	—	4·9	—
—	18,000	58·8	—	—	1·7	20·6	—	7·0	—	11·7	—

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large mononuclears.

TABLE OF BLOOD EXAMINATIONS IN CASES

Case	Author	Age	Day of observation	Red cells per cubic millimetre	Nucleated red cells per cubic millimetre	Normoblasts to megaloblasts	Colour index	Megalocytes	Poikilocytes	Poly-chromasia
17	Schleip [49]	34	1	4,452,000	None	—	1·17	—	—	Present
18	Naegeli [42]	45	1	2,168,000	315	51:12	1·06	Many	Present	—
19	Ward	—	1	4,760,000	486	7:2	0·68	—	Slight	Moderate
20	Ward [58]	44	1	4,920,000	90	94:6	0·51	Many	Moderate	Marked
21	Ward [58]	41	1	4,725,000	None	—	1·2	None	None	None
			58	4,350,000	None	—	0·942	None	None	None
			300	5,290,000	None	—	0·619	Few	Few	Frequent
			660	4,780,000	23	94:6	0·694	Many	Many	Frequent
22	Ward	51	1	5,615,000	None	—	0·758	None	None	None
23	Ward [57]	39	1	3,850,000	A few	—	0·7	—	None	—
			15	3,460,000	5,520	—	0·695	—	—	—
			20	3,930,000	3,216	—	0·57	—	—	—
			41	3,360,000	3,565	30:1	0·865	—	—	Slight
			48	3,380,000	16,000	—	0·882	—	—	—
			55	4,270,000	4,333	49:1	0·718	—	—	—
24	Arneth [1]	25	1	1,072,000	Present	—	—	Present	Present	Present
25	Kast [31]	56	1	3,500,000	—	—	—	—	—	—
			3	3,150,000	—	—	0·873	—	—	—
			6	3,020,000	Few	—	—	A few	Few	Slight
26	Turnbull	47	1	2,150,000	Many	—	1·04	Present	Present	Present
27	Luzzatto [37]	—	—	Severe anæmia	—	—	—	—	—	—
28	Braun [7]	64	—	1,500,000	Present	—	1·0	Present	Present	Present
			—	1,200,000	Present	—	1·45	Present	Present	Present
			—	1,002,000	Present	—	1·5	Present	Present	Present
29	Hirschfeld [25]	63	1	1,000,000	Present	—	1·0	Present	—	—
30	Hirschfeld [25]	53	*a*	1,800,000	—	—	1·11	—	—	—
			b	1,500,000	Present	—	1·0	—	—	—
31	Rotky [47]	—	—	—	—	—	—	—	—	—
32	Sailer and Taylor [48]	—	—	1,110,000	Present	—	0·9	—	—	—
33	Bloch [5]	41	?	3,000,000	Few	100:0	0·83	—	—	—
			1	—	—	—	—	—	—	—
			20	1,700,000	—	—	0·70	Present	—	—
34	Israel and Leyden [30]	30	1	Moderate anæmia	Present	—	—	—	—	—
35	Ehrlich [14]	25	1	Severe anæmia	—	—	—	—	Present	—
36	Boggs and Guthrie [6]	37	1	4,000,000	—	—	0·925	—	—	—

of Cancer with Bone Metastases—(*continued*).

Hæmoglobin per cent.	White cells per cubic millimetre	Polymorphonuclears	Eosinophiles	Mast cells	Transitionals	Small mononuclears	Large mononuclears	Neutrophile myelocytes	Eosinophile myelocytes	Myeloblasts	Complicating hæmorrhages
105	7,600	58·6	0·8	1·6	3·9	35·1	—	0·7	—	—	—
46	6,000	66·0	None	—	3·2	19·0	—	6·0	—	2·0	—
65	10,800	50·7	0·6	None	10·2	31·2	4·8	2·4	—	—	No
50	9,000	68·9	0·8	0·5	2·9	23·3	2·7	0·9	—	—	No
115	3,700	51·0	0·4	1·8	2·2	42·2	2·4	None	—	—	No
82	7,500	53·2	2·4	1·2	0·8	41·2	1·2	None	—	—	—
65	6,700	50·0	4·2	0·6	7·6	34·0	3·2	0·4	—	—	—
66	5,800	49·0	0·8	None	7·6	41·0	0·8	0·8	—	—	—
85	8,560	68·0	0·2	—	8·6	21·4	1·8	None	—	—	No
56	20,300	60·0	3·0	—	1·0	23·0	13·0	—	—	—	No
48	23,000		55				45		—	—	—
45	13,000	50·0	1·0	—	—	24·0	25·0	—	—	—	—
58	28,333	51·2	1·0	0·2	5·0	8·8	2·0	30·9	0·4	—	—
60	31,875	47·6	0·8	1·6	3·2	9·6	1·2	31·0	—	—	—
60	21,250	44·2	0·8	—	14·4	11·6	5·4	23·6	—	—	—
—	23,400	75·0	—	—	—	—	—	7·0	—	—	—
—	110,000	—	—	—	—	—	—	—	—	—	—
55	114,000	—	—	—	—	—	—	—	—	—	—
—	120,000	96·17	0·42	Few	—	2·16	0·16	1·09	—	—	—
45	22,000	59·0	1·0	0·5	—	31·0	—	8·5	Present	Present	Yes
—	—	—	—	—	—	—	—	Present	—	—	—
30	8,400	—	—	—	—	—	—	—	—	—	—
35	9,600	—	—	—	—	—	—	—	—	—	—
30	10,700	—	—	—	—	—	—	—	—	—	—
20	30,000	78·8	0·5	—	—	4·6	4·6	11·0	—	—	—
40	15,000	—	—	—	—	—	—	—	—	—	—
30	20,000	+	—	—	—	—	—	Many	—	—	—
—	16,000	—	—	—	—	—	—	—	—	—	—
20	45,000	—	1·5	—	—	46·0		9·0	—	—	—
50	6,000	56·7	0·1	—	1·4	30·5	4·9	6·4	—	—	—
—	—	65·0	0·1	None	0·1	23·7	2·4	8·7	—	—	—
23	—	69·0	—	—	3·0	12·0	4·0	12·0	—	—	—
—	1:50	—	—	—	—	—	—	Many	—	—	—
—	—	Few	—	—	—	—	—	Many	—	—	—
74	9,200	—	—	—	—	—	—	—	—	—	—

CASES OF CANCER WITH BONE

Author	Case	Age	Sex	Primary site	Nature of growth	Fractures	Bone pains
Frese [19]	2	28	F.	Stomach	Carcinoma	No	Yes
Kurpjuweit [32]	2	34	F.	Stomach	Epithelioma	No	Yes
Frese [19]	1	26	M.	Stomach	Carcinoma	No	Yes
Hirschfeld [25]	1	63	F.	Breast	Carcinoma	—	—
Houston [27]	1	42	F.	Breast	Scirrhus	No	No
Braun [7]	1	64	M.	Prostate	Carcinoma	—	Yes
Arneth [1]	1	25	M.	Stomach	Scirrhus	—	—
Sailer and Taylor [48]	1	—	—	Stomach	Carcinoma	—	—
Parkes Weber	1	32	F.	Stomach	Carcinoma	No	No
Hirschfeld [25]	2	53	F.	Breast	Carcinoma	—	—
Wolfer [62]	1	37	M.	Stomach	Carcinoma	—	—
Bloch [5]	1	41	—	—	Sarcoma	—	Yes
Harrington and Teacher [23]	1	64	F.	Stomach	Scirrhus	—	Yes
Parmentier and Chabrol [43]	1	45	M.	Stomach	Scirrhus	No	No
Schleip [49]	1	33	M.	Stomach	Epithelioma	—	Yes
Naegeli [42]	1	45	M.	? Stomach	Carcinoma	No	Yes
Turnbull	1	47	F.	Breast	Scirrhus	No	—
Harrington and Kennedy [22]	1	52	M.	Stomach	Scirrhus	No	Yes
Kast [31]	1	56	M.	Penis	Carcinoma	Yes	Yes
Hawley [24]	1	55	F.	Breast	Carcinoma	Yes	Yes
Kurpjuweit [32]	1	51	F.	Bile-ducts	Carcinoma	Yes	Yes
Ward [57]	5	39	F.	Breast	Carcinoma	No	—
Price-Jones [44]	1	58	F.	Breast	Carcinoma	No	—
Price-Jones [44]	2	63	F.	Breast	Carcinoma	No	No
Kurpjuweit [32]	3	42	M.	Stomach	Carcinoma	No	—
Ward [58]	3	41	F.	Breast	Carcinoma	Yes	Yes
Schleip [49]	2	34	M.	Appendix	Colloid cancer	—	Yes
Ward	4	—	F.	Breast	Epithelioma	No	Yes
Ward [58]	2	44	F.	Breast	Carcinoma	No	Yes
Ward	5	51	M.	Glands	Sarcoma	No	Yes
Boggs and Guthrie [6]	1	37	F.	Breast	Epithelioma	No	Yes

Metastases, Clinical Findings, &c.

Splenomegaly	Spleen myeloid	Hæmorrhages	Metastases	Lowest red cell count	Highest percentage of myelocytes
Yes	Yes	Retinal	Lungs, liver, pleura, glands, sternum, vertebræ, ribs, femur	681,000	8·0
Yes	Yes	Melæna, purpura	Liver, pancreas, glands, vertebræ (ribs free)	718,000	11·0
No	—	Retinal, epistaxis, gums	Lungs, brain, glands, ribs, vertebræ, skull, pelvis	800,000	None
Yes	—	—	Glands, liver, ribs, femur, skull	1,000,000	11·0
—	—	Retinal, purpura, epistaxis, hæmoptysis	Skin, omentum, liver, spleen, tibia	1,000,000	1·2
—	—	—	Sternum, femur, tibia	1,002,000	—
—	—	—	Lung, liver, spleen, glands, sternum, vertebræ	1,072,000	7·0
—	—	—	—	1,110,000	9·0
No	No	Retinal gums	Liver, suprarenals, glands, humerus	1,056,000	11·4
Yes	—	—	Adrenals, liver, clavicle, skull, femur, ribs	1,500,000	Many
—	—	—	Lungs, liver, pancreas, femur, vertebræ	1,550,000	4·0
Yes	—	—	Kidney, suprarenal, ribs, vertebræ, femur	1,700,000	12·0
Yes	—	Frequent melæna	Pleura, liver, diaphragm, œsophagus, kidneys, pancreas, ribs, femur, humerus, vertebræ	1,600,000	5·0
Yes	Yes	None	Femur, glands	1,940,000	8·6
No	—	—	Vertebræ, ribs, pelvis, skull	1,984,000	18·7
No	—	Purpura, epistaxis	Liver, vertebræ, sternum	2,168,000	8·0
Yes	Yes	Purpura, gums, vaginal	Glands, liver, spleen, ovary, femur, vertebræ, sternum, ribs	2,150,000	8·5
?	?	None	Two glands, sternum, ribs, femora (vertebræ free and tibiæ)	2,325,000	3·8
Yes	Yes	None	Liver, pleura, heart, glands, kidneys, ribs, sternum, vertebræ	3,020,000	1·09
—	—	—	Breast, femora, vertebræ, fibulæ, &c.	3,172,000	None
Yes	Yes	None	Glands, ovaries, thyroid, pleura, kidneys, adrenal, skull, ribs, vertebræ, sacrum, sternum	3,200,000	17·0
—	—	—	—	3,360,000	31·3
—	—	—	Glands, breast, pleura, vertebræ	3,760,000	None
—	—	—	Glands, breast, mesentery, peritoneum, liver, vertebræ	4,270,000	None
—	—	Hæmatemesis	Liver, glands, vertebræ	4,320,000	4·0
Yes	—	None	Glands, femur, ribs	4,350,000	0·8
Yes	—	—	Glands, mesentery, vertebræ, sternum	4,452,000	0·7
—	—	None	Glands, sternum, ribs	4,760,000	2·4
—	—	None	Vertebræ	4,920,000	0·9
No	—	None	Liver, lungs, pancreas, glands, vertebræ, ribs, sternum	5,615,000	None
—	—	—	Skull, ribs, femora, ilia, tibia	4,000,000	None

CASES OF SECONDARY LEUKÆMIA AND

No.	Author	Age	Result	Autopsy	Primary disease	Glands		Liver		Spleen	
						Enlarged	Myeloid	Enlarged	Myeloid	Enlarged	Myeloid
1	Cabot	20	R.	No	Sore throat	+	—	—	—	—	—
2	Wiczkowski	24	D.	No	Crushed foot—probably septic	+	—	+	—	+	—
3	Hirschfeld and Kothe	16	—	No	Compound fracture of leg—sepsis	+	—	—	—	—	—
4	Lindsay Steven	2	D.	Yes	Broncho-pneumonia	—	—	—	—	—	—
5	Cabot	6	R.	No	Pertussis, pneumonia	—	—	—	—	—	—
6	Lenoble	$\frac{3}{12}$	D.	Yes	Multiple abscesses	+	+	—	—	+	+
7	Lenoble	$\frac{2}{12}$	D.	No	Infective jaundice	—	—	+	—	0	—
8	Lenoble	3	D.	—	Von Jaksch anæmia	—	—	—	—	+	—
9	Cabot	—	R.	No	Septic finger	+	—	—	—	—	—
10	Labbé and Delille	$\frac{1}{12}$	—	—	Congenital syphilis	—	—	—	—	+	—
11	Turnbull	47	D.	Yes	Cancer	+	+	+	+	+	+
12	Cabot	20	R.	No	Persistent boils	+	—	—	—	—	—
13	Cabot	37	R.	No	Adenopathy (? nature)	+	—	—	—	—	—
14	Hirschfeld and Kothe	10	D.	—	Gangrenous appendicitis	—	—	—	—	—	—
15	Morawitz	16	R.	No	"Feverish heart malady"	—	—	—	—	—	—
16	Simon	—	R.	No	Fractured ankle—sepsis	—	—	—	—	+	—
17	Austrian	4	D.	Yes	Broncho-pneumonia and mastoiditis	+	—	+	+	+	—
18	Cabot	$1\frac{3}{12}$	—	—	Pertussis, pneumonia	...	...	...	...	...	...
19	Kast	56	D.	Yes	Cancer	+	+	+	—	+	+
20	Kurpjuweit	34	D.	Yes	Cancer	+	+	+	+	+	+
21	Parmentier and Chabrol	45	D.	Yes	Cancer	+	—	—	—	+	+
22	Kurpjuweit	51	D.	Yes	Cancer	+	—	+	—	+	+
23	Frese	28	D.	Yes	Cancer	+	—	+	—	+	+
24	Naegeli	45	D.	Yes	Cancer	—	—	+	—	0	—
25	Ward	39	—	No	Cancer	+	—	—	—	—	—

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* Includes large

OTHERS REFERRED TO IN PRECEDING PAGES.

Red cells per cubic millimetre	Nucleated red cells per cubic millimetre	Hæmoglobin	White cells per cubic millimetre	Polymorpho-nuclears	Eosinophiles	Mast cells	Transitionals	Small mononuclears	Large mononuclears	Neutrophile myelocytes	Eosinophile myelocytes	Myeloblasts
—	—	—	9,000	28·0	1·0	—	—	71·0		—	—	—
5,600,000	—	—	3,600	36·0	—	2·0	—	62·0		—	—	—
—	—	—	27,000	—	—	—	—	—	—	—	—	—
—	—	—	590,000	—	—	—	—	—	—	—	—	—
—	—	—	87,000	—	—	—	—	—	—	—	—	—
—	—	—	108,000	—	—	—	—	—	—	—	—	—
4,800,000	—	90	236,000	—	—	—	—	—	—	—	—	—
—	—	60	227,000	33·6	0·5	—	—	50·2	15·2	—	—	+
—	—	—	72,000	—	—	—	—	—	—	—	—	—
—	—	—	94,600	30 0	—	—	—	66·0	—	—	—	—
3,749,000	—	70	31,000	40·3	5·0	0·5	0·7	49·0	4·3	0	0	0
—	Present	—	—	50·8	0·6	0·5	5·0	25·0	3 5	14·5	0·1	0·1
—	Present	—	—	51·0	1·7	0·6	—	6·3	34·4	6·0	—	—
—	—	—	20,000	—	—	—	—	70·0		—	—	—
1,984,000	300	—	Increased	8·0	7·0	—	—	32·0	50·0	3·0	—	—
2,150,000	Many	45	22,000	59·0	1·0	0·5	—	31·0	—	8·5	+	+
5,180,000	—	—	3,400	18·0	—	—	—	82·0		—	—	+
—	—	—	16,400	14·0	—	—	—	86 0		—	—	—
—	—	—	15,000	14·0	—	—	—	86·0		—	—	—
—	—	—	30,500	25·0	—	—	—	8·0	67·0	—	—	—
—	—	—	14,500	51·0	1·6	—	—	41·0	8·3	—	—	—
—	—	—	8,200	56·0	2·0	—	—	38·0	4·0	—	—	—
1,000,000	—	—	190,000	80·6	—	—	—	—	12·0	7·3	—	—
881,000	294	25	9,800	74·0	0·5	0·5	1·5*	19·0	—	4·5	—	—
1,300,000	210	35	4,000	65·0	0	0·5	5·0*	14·5	—	13·5	1·5	—
1,952,000	—	40	5,400	49 0	1·0	0	2·6*	41·2	—	6·2	—	—
3,200,000	—	60	9,800	62·0	3·4	0·6	9·0*	25·0	—	0	0	0
4,400,000	—	90	4,500	63·0	1·0	0	5·0*	31·0	—	0	0	0
—	—	—	—	83·0	—	—	—	—	—	—	—	—
—	4,000	—	50,000	56·2	6·2	17·5	—	3·0	2·5	15·0	1·2	—
—	Few	—	—	—	—	4·0	—	—	—	Few	—	—
—	—	—	—	59·0	4·0	1·0	—	30·0	10·0	0	—	—
4,860,000	—	87	130,000	—	—	—	—	—	—	—	—	—
—	1,464	—	183,000	52·0	4·0	—	3·0	24·0	0·6	12·0	—	4·4
—	1,512	—	126,000	56·0	3·0	—	2·0	21·0	1·6	14 0	—	2·4
—	3,456	—	192,000	54·0	3·0	—	2·0	22·0	4·0	12·0	—	3·0
—	—	—	103,000	35·0	0·5	—	—	64·5	—	—	—	—
3,150,000	—	55	114,000	—	—	—	—	—	—	—	—	—
3,020,000	Few	—	120,000	96·1	0·4	Few	—	2·1	0·1	1·1	—	—
1,825,000	91	25	9,100	48·4	1·0	—	8·2	19·2	12·2	11·0	—	—
718,000	177	20	6,700	42·5	1·2	1·0	10·5	21·7	15·3	8·7	—	-
1,940,000	1,540	60	3,500	60·0	4·0	—	—	21·0	6·0	8 0	—	0·6
3,200.000	Present	50	26,600	29·5	1·5	—	11·5	46·5		16·0	1·0	—
681,000	Present	12	10,150	64·5	1·0	0·5	11·0	15·0	—	8·0	—	—
2,168,000	315	46	6.000	66·0	0	—	3·25	19·0	—	6·0	—	2·0
3.360,000	3,565	58	28.333	51·2	1·0	0·2	5·0	8·8	2·0	30·9	0·4	+
3,380.000	16,000	60	31,875	47·6	0·8	1·6	3·2	9·6	1·2	31·0	—	+
4,270,000	4,333	60	21,250	44·2	0·8	—	14·4	11·6	5·4	23·6	—	—

mononuclears.

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DISCUSSION.

Dr. F. PARKES WEBER said that the bringing of all these cases together was very important for purposes of comparison and classification. He differed from Dr. Gordon Ward in regard to terminology. An absolute or relative increase in the white blood cells or in a particular kind of white blood cells, when the cause of the increase was recognized, should, Dr. Weber believed, be termed an absolute or relative *leucocytosis*, whether it were a general leucocytosis, a polymorphonuclear leucocytosis, a myelocytosis, or a lymphocytosis, and whether in nature it were reactive towards an infection or due to mechanical or toxic disturbance of the blood-forming organs. Other cases of absolute or relative increase in the white blood cells could be classed as leukæmias, whether myeloid—i.e., medullary (including myelocytic and myeloblastic) or lymphatic (including lymphocytic and lymphoblastic). Formerly a moderate increase of white cells was called a leucocytosis and a large increase was called a leukæmia or leucocythæmia. That plan was very misleading, but now Dr. Gordon Ward was grouping together under the term "secondary leukæmia" a great number of cases which he (Dr. Weber) believed should be included as examples of leucocytosis, myelocytosis, or lymphocytosis, because the cause of the increase of the white cells was known. The term "leukæmia" should, he believed, be reserved for those cases in which the cause of the absolute or relative increase in the white cells remained unknown—that is to say, the term "leukæmia" should be used only for those cases of increase of white cells which in the present state of knowledge were "primary." To speak of "secondary leukæmias" was, he thought, *a contradiction in terms*, and made the existing confusion in the nomenclature "worse confounded." He considered by analogy that an excess in the red blood cells, when the reason was known, should be called an "erythrocytosis," but when the increase was of unknown cause, that is to say (according to the present state of knowledge) "primary," it should be called an erythræmia. A case could not be classed as one of leukæmia merely because a myeloid transformation was discovered in the spleen or elsewhere. Such myeloid transformation might be reactive in nature and might be experimentally produced. Compare the experimental work of Von Domarus, R. Herz, A. Werzberg, F. Albrecht, &c. See also Moulinier's paper on "Complete Myeloid Tranformation of the Spleen in Subacute Poisoning by Perchloride of Mercury."[1] A condition of osteosclerosis occurred in some cases of myeloid leukæmia and a condition of bone-softening (from absorption of bone salts) in others, but he (Dr. Weber) did not believe there were any cases in which it could be reasonably supposed that a leukæmia had developed as a result of osteo-sclerosis. He was glad to find that Dr. Ward had not included such cases as examples of "secondary leukæmias."

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[1] *Arch. de Med. Navale*, Par., 1903, lxxx, p. 347.

In a case of myeloid leukæmia (spleno-medullary leucocythæmia) accompanied by acute Ménière's symptoms, which he (Dr. Weber) described in 1900,[1] the new bone formation in the bones examined (bones of the ear) was evidently a result of (or part of) the leukæmic disease. In a case of myeloid leukæmia reported by Dr. F. W. Mott at the same meeting[2] the necropsy showed a condition of softening and rarefaction of the petrous bone, probably likewise in some way a result of the leukæmic disease (the softening probably being a more direct effect, and the new bone formation a more chronic and "reactive" process). He did not think that there was sufficient reason for applying the term "leukæmia" to so-called splenic anæmia (pseudo-leukæmia) of infants. If the exciting cause of what one now called leukæmias (what Dr. Ward termed "primary leukæmias") ultimately became known, there should be no leukæmias left in medical terminology, for to speak of "secondary leukæmias" was (as already stated) to introduce a "contradiction in terms"; all leukæmias could then be grouped amongst the leucocytoses.

Dr. GORDON WARD, in reply, apologized to Dr. Parkes Weber for having withdrawn certain cases from his paper since he showed him a draft. If he understood his criticisms aright, they were directed to disputing the whole basis of the theory of secondary leukæmia. He would reserve the term "leukæmia" for what he had called "primary leukæmia," and all other conditions he would refer to as leucocytosis, myelocytosis, &c., according to the predominant cell in the blood. To his mind, the condition of the blood itself as discovered in one or two examinations of that in some cutaneous area was as often as not a very misleading factor in the diagnosis of blood diseases so-called. He had therefore endeavoured to focus attention on the change in the organs, although he admitted that in this paper he, to a large extent, had to depend on cases which were very partially examined and in which these changes were sometimes more a matter of inference than of ascertained fact. He most certainly believed that we could distinguish at least two kinds of hæmopoietic reaction to sepsis — i.e., the ordinary polymorph leucocytosis which was not accompanied by changes in the spleen, glands, or liver, and the "secondary leukæmia" in such cases as those of Austrian, in which there were changes in the organs and in which the blood approximated to that of primary leukæmia. Both of these conditions could of course be produced experimentally; that this should be the case was no argument against their essential difference. The conception of secondary leukæmia harmonized and reduced naturally to one group a great number of anomalous cases, of which the cases of cancer with which he had dealt were good examples. It had long been desirable that these cases should be harmonized, for they had hitherto merely existed as exceptions which had seemed to invalidate otherwise acceptable rules. Secondary leukæmia, of course, was hardly ever a very marked condition as seen in the blood-stream, and in this respect resembled secondary anæmia. This was an aspect of the question which might properly be emphasized, for the term "leukæmia" had most unfortunately come to denote in the minds of many people not a disease involving many organs, which it was, but merely a condition of the blood-stream. It could not be too strongly emphasized that there were hardly any true blood diseases—i.e., diseases of the circulating blood cells. There were, in fact, only two classes; in the first we found coal gas poisoning and the two varieties of enterogenous cyanosis, and in the second malaria and similar parasitic diseases. In none of these were the blood-forming organs affected except in a manner secondary to the affection of the blood cells in the circulation. In other diseases the determining cause acted primarily on the blood-forming organs, and what we saw in the blood-stream was only a more or less accurate reflex. It appeared to him that the cases of Cabot—which he called infective lymphocytosis—and the cases of Austrian and Turnbull were not examples of a process which was usefully described in terms of the blood findings. They were allied to each other as lymphæmia and myelæmia were allied to each other and histologically also they were leukæmias. He believed that the leukæmic reaction was by no means confined to the primary leukæmias, and these cases, to quote typical examples, if they were to be rationally classified at all, seemed to be necessarily included as examples of a process to which the name "secondary leukæmia" was alone applicable.

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[1] *Med.-Chir. Trans.*, Lond., 1900, lxxxiii, p. 185.

[2] *Med.-Chir. Trans.*, 1900, lxxxiii, p. 209.

Medical Section.

March 24, 1914.

Dr. SAMUEL WEST, President of the Section, in the Chair.

The Diagnosis of Pulmonary Tuberculosis.

By J. A. D. RADCLIFFE, M.B., and O. L. V. DE WESSELOW, M.B.

IN the practice of every sanatorium a certain number of cases are admitted with a diagnosis of pulmonary tuberculosis which, though they show suspicious physical signs in the lung, or give a history suggestive of pulmonary tuberculosis, either bring up no sputum or show no tubercle bacilli in the sputum produced. This group is considerably diminished by modern methods of sputum examination (especially the sedimentation method of Ellerman and Erlandsen), yet it still constitutes a considerable proportion of the total admissions. Thus in the King Edward VII Sanatorium, in the year 1911-12, bacilli were not demonstrated in the sputum of 24·7 per cent. of the patients admitted. That such a proportion of non-bacillary cases is not uncommon in the experience of other sanatoria will, we think, be admitted—for instance, in German sanatoria, according to Engelman, bacilli were not demonstrated in the sputum of 48 per cent. of cases, and, to judge from recent papers, a large number of such cases are under treatment at dispensaries. The group is also likely to be increased still further with more widespread appreciation of the advantages of early diagnosis, and with insistence on the value of treatment in the "pre-bacillary stage."

It is therefore of considerable importance, in estimating the results of sanatorium or other methods of treatment, to determine what proportion of such patients are actually suffering from "incipient closed phthisis," and what proportion from other conditions such as healed pulmonary tuberculosis or apical collapse. With this object, other methods than physical examination of the chest and the search for bacilli in the sputum must be employed, and unless this is done no conclusions can justifiably be drawn from statistics which include this group. Moreover, it is in the interests of the patient that he should, if possible, be spared the waste of time and money involved in a prolonged course of unnecessary treatment.

Two considerations would suggest that the proportion of cases of active incipient phthisis in this group is not in reality large. In the first place, the after-histories of patients, in whose sputum bacilli have not been found on careful and repeated examination, are far more satisfactory than those of patients showing an equally limited lesion, but with a positive bacillary find; from this it would seem reasonable to infer that the former class includes many instances of patients suffering from other conditions than incipient closed phthisis, for it is difficult to believe that the occurrence of ulceration in a tuberculous process would add greatly to the gravity of the prognosis, unless such ulceration was always accompanied by mixed infection, and this is now known to be comparatively infrequent. Secondly, those patients who leave the institution without bacilli in the sputum show, on the whole, more satisfactory after-results than those who have not lost their bacilli in the course of treatment, the explanation probably being that in many cases a repeated negative bacillary find indicates a true cure of the disease. If a repeated negative bacillary find has thus a considerable prognostic importance, it would seem unreasonable not to attach equal weight to a repeated negative examination in our diagnosis of the presence or absence of active disease. Further, since from anatomical considerations any site of tuberculous infection in the lung cannot be far removed from an air passage we should expect the appearance of bacilli early in the disease, that is, that the condition of closed incipient phthisis would not persist for long. As Cornet points out, if the lesion begins in the smaller bronchi, bacilli would appear in the sputum before there was any possibility of the disease producing definite physical signs; and it is, in fact, not uncommon to see cases in which bacilli are present in the sputum before the disease is sufficiently advanced to produce such signs. In cases, therefore, presenting definite physical evidence of disease in the lung we should a fortiori expect to find bacilli in the sputum.

Of further methods of diagnosis, the animal test of the sputum has not been available to us; the conjunctival and cutaneous reactions (with the possible exception of the quantitative von Pirquet), are admittedly of little value in determining the activity of a tuberculous process in the adult; the precipitin and agglutination tests are of little use in diagnosis. We have, therefore, applied to our patients three further tests, the value of which is more generally admitted—namely, the subcutaneous tuberculin test, the complement-fixation test, and determinations of the opsonic index before and after exercise.

The material available consisted of forty-two consecutive non-bacillary patients sent to the King Edward VII Sanatorium as needing treatment for active tuberculosis, and, we think, representative of the group as a whole. By submitting them to further tests we hoped to arrive at some conclusion as to the prevalence of active disease in the non-bacillary group, and also as to the comparative value of the different tests employed. The methods employed were as follows:—

(1) For sputum examination the ordinary film preparation, and, in the majority of cases, the sedimentation method of Ellerman and Erlandsen. The latter method has been found at the sanatorium to give positive results in 40 per cent. of cases negative to the film preparation, and therefore considerably reduces the non-bacillary group. The staining method used throughout has been the Ziehl-Neelsen. The methods of Much and Karl Spengler have not been employed as they are generally admitted to show no advantages over the Ziehl-Neelsen.

(2) For the opsonic method the technique used was that of Wright, with slides re-numbered before counting. No bacillary debris was added to the emulsion, and as unity the mean of two normal sera, counted separately, was taken. Blood samples were taken from the individual to be tested, before exercise, and one, six, and twenty-four hours after; the exercise being graduated with a view to producing an auto-inoculation, and combined with some deep breathing. In view of the admitted working error, and of the fact that only two normal sera were employed as controls, too great stress cannot be laid on slight variations, and an index below 0·75 or above 1·25, or a swing of 0·3, was taken as definite evidence of active disease. Judged by this standard, positive results were obtained at the first test in twelve out of seventeen cases of active pulmonary tuberculosis.

(3) Complement fixation. It is impossible in this paper to describe in detail the method of complement fixation. It can only be stated that the technique conformed to that of the original Wassermann reaction, and that a fresh emulsion of tubercle bacilli was used as an antigen. As a rule, the test was carried out in a quantitative manner, and if a negative result was obtained, a second and even a third examination was made. Apparently the value of the method in tuberculosis depends to a great degree on the antigen, but the complement is an equally important factor, and different complements differ widely in their suitability. Of 382 patients with tubercle bacilli in the sputum, 327 gave a positive result, whereas out of 151 examinations of the sera of forty-four healthy individuals all were negative. In deciding whether a reaction was to be considered positive, complete fixation only was taken as being

definite; if anything more than a trace of colour was apparent in the supernatant fluid the reaction was considered negative. In this way, no doubt, a number of positive cases were missed, but this was not considered important until the limits of the specificity of the reaction are more clearly understood.

For the subcutaneous tuberculin test the dosage employed has been that recommended by Bandelier and Roepke, a slightly modified form of Koch's original method—namely, 0·0002, 0·001, 0·005, 0·01 c.c., given at forty-eight-hourly intervals. Albumose-free tuberculin was used, and the final dose was not repeated. All the cases tested were afebrile, and were kept at rest, though not in bed, during the course of the test. In the event of a slight rise of temperature the exciting dose was repeated. In interpreting the results of this test we have been guided by the following considerations: Koch was able to conclude from a large series of tests that the absence of a reaction showed that no recent or progressive tuberculosis was present. The test, therefore, differs from most available methods, in that a negative result has a very definite value. On the other hand, it is almost universally agreed that the occurrence of a focal reaction in the lung is definite evidence of active tuberculous disease. The significance of a febrile without a focal reaction is less certain; from the statistics of Franz and Beck we know that from 40 to 60 per cent. of clinically sound individuals give such a reaction. The reports of the Tübingen Medical Institute (quoted by Bandelier and Roepke) show that of forty-seven suspected individuals who had given a febrile reaction only, forty-four were alive and fit for work two and a half years later; while of 135 patients who had given a focal reaction, only fifty-one were fit for work after the same interval, though the members of the latter group had been submitted to a course of sanatorium treatment. Walterhofer disregards a febrile reaction to 1 mgr. and upwards. Bandelier and Roepke, in cases of general without focal reaction, take into consideration the history, general condition, and clinical symptoms of the case before deciding on the necessity of further treatment. On the whole, then, it would appear probable that the occurrence of a febrile reaction without a focal is merely evidence of past infection and not of active disease, and this view is borne out by the further tests applied in our series.

The determination of the presence of a focal reaction is not always easy. Slight changes in percussion note, or in the degree of harshness of the breath sounds, are not readily determined from day to day. The appearance or increase in extent of crepitations, or, in pleural cases, the development of friction, are more easily made out, and leave less

TABLE A.—GIVING NEITHER FEBRILE NOR FOCAL REACTIONS.

Case	Family history or contact	Maximum dose	Local reaction to	Number of sputum examinations and results	Sputum during reaction	Opsonic indices	Complement fixation	
1	–	c.c. 0·01	c.c. 0·005	No sputum	No sputum	0·95, 1·04, 0·96, 1·09	+ (incomplete)	Impaired note above right clavicle
2	–	,,	none	3 – E. –	E. –	0·86, 0·96, 0·99, 0·90	–	Weak B.S., impaired note above both clavicles
3	+	,,	0·01	3 –	E. –	0·98, 0·98, 0·98, 0·93	–	Weak B.S., impaired note above both clavicles
4	–	0·005	none	1 – E. –	No sputum	1·10, 1·13, 1·23, 1·13	–	Impaired note, harsh B.S., increased V.R. to second rib on right
5	–	0·01	,,	1 –	,,	1·03, 1·13, 1·02, 0·86	–	Slightly impaired note left apex, no definite change in B.S.
6	–	,,	,,	2 –	E. –	1·01, 0·92, 1·08, 0·92	–	Impaired note, weak B.S., diminished V.R. right base
7	–	,,	0·005	No sputum	E. –	1·00, 0·93, 1·09, 1·13	–	Impaired note, weak B.S. to second rib on right
8	–	0·005	,,	1 – E. –	E. –	1·18, 1·24, 1·18, 0·98	–	Slightly impaired note, prolonged expiration left apex
9	–	,,	,,	5 – E. –	E. –	0·79, 0·84, 0·79, 0·84	–	Recurrent bronchitis, no definite physical signs
10	–	0·01	none	4 –	E. –	0·80, 0·80, 0·95, 0·85	–	Recurrent bronchitis, no definite physical signs
11	+	,,	,,	2 –	No sputum	0·96, 0·98, 0·95, 1·06	–	Slight impairment of note, prolonged expiration left apex
12	–	,,	0·01	No sputum	,,	1·00, 1·13, 1·00, 0·99	–	No definite physical signs

Abbreviations: B.S. = Breath sounds. V.R. = Vocal resonance. E. = Sedimentation method.

room to individual bias. We do not attach much importance to slight fluctuations in the amount of sputum, but any sputum obtainable during the course of the reaction should be examined by the sedimentation method, as it frequently affords valuable confirmatory evidence of the presence of a focal reaction.

Taking first the cases in which no definite evidence of active disease was obtained, we can class under this head no fewer than thirty out of a total of forty-two cases examined. The physical signs in the majority of these cases were those associated with early apical infiltration and collapse—that is to say, a moderate degree of impairment of percussion resonance, weakened breath sounds with prolongation of the expiratory murmur, or harsh bronchial breath sounds with increased resonance, and in some cases slight flattening. *In none of the cases were any moist crepitations present either on normal respiration or on cough.* In thirteen cases out of thirty definite unilateral diminution in Krönig's field was noted. The distribution of the pulmonary lesions was as follows: In thirteen cases right apex, in five left apex, and in three at both apices: two cases showed signs of old pleurisy at the right base, one case diffuse bronchitis, and six cases no definite physical signs. Of these thirty cases six gave no reaction of any kind to tuberculin, six gave a local reaction at the injection site only, and eighteen gave both febrile and local reactions without any evidence of a focal. Of these eighteen cases giving a febrile reaction, eight gave histories of contact with tuberculous cases, while of the twelve giving no reaction only two gave such histories. The eighteen febrile reactions obtained varied from 100·2° to 104° F., and the dose to which reaction was obtained was in four cases 0·001 c.c., in seven 0·005 c.c., and in seven 0·01 c.c. Incomplete complement fixation was obtained in one case, and in another a swing of 0·43 in the opsonic index. With these exceptions both tests gave negative results. In twelve cases sputum was obtained during the reaction and examined by the sedimentation method, with, in every case, negative results: in the remaining cases no sputum was obtained during the reaction. Our results therefore show a high degree of consonance between the different tests employed, and agree with the generally accepted idea that a febrile reaction alone is of little importance in the diagnosis of the disease.

It has been pointed out by Blümer, and Gottfried Maier that it is not uncommon to see patients, usually women, in whom right apical phthisis has been diagnosed, but in whom the lesion proves on observation to be a collapse induration associated with nasopharyngeal catarrh and mouth-breathing. Since the condition is characterized by impaired

TABLE B.—GIVING A FEBRILE BUT NO FOCAL REACTION.

Case	Family history or contact	Dose to which reaction was obtained		Number of sputum examinations and result	Sputum during reaction	Opsonic indices	Complement fixation	
		c.c.	F.					
13	–	0·001 (rep.)	101°	2 – E. –	No sputum	1·00, 1·06, 1·00, 0·90	–	Impaired note, harsh B.S. left apex
14	–	0·001 (rep.)	102·2°	1 –	,,	1·00, 0·92, 1·01, 0·90	–	Impaired note, weak B.S. left apex
15	–	0·001 ...	102·2°	No sputum	E.	1·03, 1·02, 1·02, 1·17	–	Impaired note, flattening, harsh B.S. right apex to third rib
16	–	0·001 ...	102·4°	6 –	E. –	1·08, 1·11, 1·02, 1·00	–	Recurring bronchitis, diffuse rhonchi
17	+	0·005 ...	102·6°	2 – E. –	No sputum	0·91, 0·76, 0·89, 0·95	–	Signs, old pleurisy right base
18	+	0·005 ...	102·2°	4 –	,,	0·91, 0·89, 1·00, 1·03	–	Impaired note right apex to third rib, impure B.S., increased V.R.
19	–	0·005 ...	102°	2 – E. –	,,	0·95, 1·05, 0·93, 0·98	–	Impaired note right apex, no definite change in B.S.
20*	+	0·005 ...	100·4°	No sputum	,,	0·66, 0·74, 0·66, 0·89	+	Impaired note, increased V.R. right apex to third rib, no moist sounds
21	–	0·005 ...	100·8°	4 – E. –	E. –	0·95, 0·90, 1·13, 0·94	–	No definite physical signs
22	+	0·005 ...	103·6°	4 –	E. –	0·97, 1·05, 0·93, 1·01	–	Impaired note, flattening, harsh B.S. to second rib on right
23	–	0·005 (rep.)	103.2°	1 – E. –	E. –	0·89, 0·89, 0·89, 0·95	–	Impaired note. flattening, harsh B.S. to second rib on right
24	–	0·005 (rep.)	101·6°	1 – E. –	No sputum	1·02, 1·10, 1·05, 1·00	–	Impaired note, bronchial B.S. right apex
25	+	0·01 ...	100°	4 –	,,	0·97, 1·03, 1·03, 0·86	–	No definite physical signs
26	–	0·01 ...	101·6°	2 –	,,	0·90, 0·95, 0·95, 0·89	–	Impaired note over right apex, harsh B.S. to second rib
27	–	0·01 ...	99·6°	2 –	,,	0·91, 0·90, 0·88, 0·88	–	Impaired note over right apex, harsh B.S. to second rib
28	+	0·01 ...	103·6°	2 –	,,	0·95, 0·93, 0·88, 0·94	–	Impaired note over right apex, harsh B.S. to second rib
29	+	0·01 ...	104°	No sputum	,,	0·98, 1·02, 1·06, 1·02	–	No definite physical signs
30	+	0·01 ...	101·8°	2 –	,,	1·06, 0·86, 0·90, 1·06	–	Poor note, weak B.S. above both clavicles
31	–	0·01 ...	101·8°	No sputum	,,	0·79, 0·79, 1·23, 1·23	–	Impaired note, harsh B.S. to second rib on right

* *Vide* text.

Abbreviations : B.S. = Breath sounds. V.R. = Vocal resonance. E. = Sedimentation method.

note and movement, and harsh breath sounds at the right apex, and since the patient gives a history of cough and mucous expectoration, a diagnosis from incipient phthisis is not easy. The physical signs are said to persist after the catarrh which caused them has cleared up. Eight of our patients showed such a syndrome of an unhealthy nasopharynx with right apical signs, but it is fair to say that of four other patients showing such catarrh one showed signs at both apices, one at the left apex, and two no physical signs in the lungs. Among other causes of symptoms among the thirty negative cases were mitral regurgitation, para-Malta fever, adenoma of thyroid, a pleural thickening at the site of a lobar pneumonia, persistent menorrhagia, and recurring bronchitis (three cases). In two cases hæmoptysis had occurred (in one of these after trauma). In eight cases no definite cause of illness could be discovered.

We have seen one case (No. 20) in which a febrile reaction was obtained without any evidence of a focal reaction, though there was good reason to believe that the disease was active. A febrile reaction of 2° was obtained to a dose of 0·005 c.c. AF., but no signs of a focal reaction in the lung could be detected. The patient gave complete complement fixation, and her indices worked out at 0·66, 0·74, 0·66, 0·89. No sputum was obtainable at any time. The case was, however, complicated by the fact that the patient had six months previously received a long course of tuberculin ending with a dose of 0·07 c.c. AF. Previous to this course her complement fixation had been positive, she had twice previously been admitted to the sanatorium, her father had died of phthisis, and she had twice suffered from hæmoptysis. Before admission suspicions of a relapse were aroused owing to an influenza-like attack, accompanied by loss of weight, and the appearance of crepitations at the right apex. When admitted, however, no moist sounds were present. In this case, therefore, either no focal reaction was obtained with the tuberculin test, or if present it was missed.

In the group in which evidence of active disease was obtained, in spite of absence of bacilli from the sputum on repeated examination, we have only eleven cases. Of these, two were not tested with subcutaneous tuberculin owing to the extent of their physical signs; the remainder gave a focal reaction—in three cases to 0·001 c.c., in two to 0·005 c.c., in four to 0·01 c.c. The striking point about this group was that of the eleven, only three showed limited apical lesions without moist sounds, while six were far enough advanced to warrant their inclusion in Turban's groups ii and iii, and gave histories of disease of considerable duration. In the other two cases a pleural focal reaction

TABLE C.—CASES GIVING A FOCAL REACTION.

Case	Family history or contact	Focal reaction to	Number of sputum examinations and result	Sputum during reaction	Opsonic indices	Complement fixation	
		c.c. F.					
32	+	0·001 ... 102°	1 –	No sputum	0·72, 0·77, 0·96, 0·86	–	Indefinite signs right apex
33	–	0·001 ... 103·4°	2 –	E. –	1·16, 1·03, 0·97, 1·23	+	Impaired note, harsh B.S. right and left apices
34	+	0·001 (rep.) 103°	4 – E. –	E. –	1·03, 0·95, 1·02, 0·90	–	Harsh B.S., impaired note, coarse crepitations on cough at three lobar apices
35	–	0·005 (rep.) 102°	3 – E. –	E. –	0·56, 0·58, 0·68, 0·58	+	Slight impairment of note, harsh B.S. right apex, pleural focal reaction at right base (site of old pleurisy)
36	+	0·005 (rep.) 101·4°	3 – E. –	E. +	0·97, 1·00, 0·90, 0·91	+	Harsh B.S., impaired note, a few coarse crepitations at right upper and lower lobar apices
37	–	0·01 ... 101·4°	3 –	E. +	0·70, 0·88, 0·97, 0·63	+	Harsh B.S., impaired note, crepitations on cough to third rib on right
38	–	0·01 ... 99·6°	3 –	E. +	0·73, 0·83, 0·53, 0·66	+	Impaired note, harsh B.S., crepitations on cough at three lobar apices
39	–	0·01 ... 103·4°	3 – E. –	E. –	0·89, 0·75, 0·63, 0·89	–	Signs of old pleurisy left base, pleural focal reaction
40	–	0·01 ... 100°	3 – 2 E. –	E. +	0·93, 0·84, 0·84, 0·89	+	Harsh B.S., impaired note to second rib on right
41*	+	—	6 – 2 E. –	—	0·71, 0·82, 0·76, 0·81	+	Signs of infiltration at three lobar apices, excavation left upper apex
42*	–	—	5 – E. –	—	0·75, 0·95, 0·75, 0·63	+	Signs of infiltration at upper and lower apices right and left

* Cases not tested with tuberculin.

Abbreviations: B.S. = Breath sounds. V.R. = Vocal resonance. E. = Sedimentation method.

was obtained without signs of activity in the lung. Eight cases of the eleven gave a completely positive complement fixation, and seven showed definite indications of active tuberculosis by the opsonic test. The value of sputum examination during the course of the reaction is evidenced by the fact that in four cases bacilli were found by the sedimentation method in such sputum.

In the two cases which were not tested with subcutaneous tuberculin very extensive lesions were present. In one extensive infiltration of three lobes with cavity formation, in the other infiltration of four lobar apices. In the one case the sputum had been examined on six occasions by the film, and twice by the sedimentation method; in the other, one sedimentation and five film examinations were made, but tubercle bacilli were never found. Both cases gave, however, positive results with both opsonic and complement-fixation tests. The sputum could not unfortunately be tested on a guinea-pig.

The tests employed thus show a very fair degree of consonance. Of twelve cases diagnosed as active tuberculosis, a focal reaction was obtained in nine with subcutaneous tuberculin, two were not tested owing to the extent of the disease, and in one case no focal reaction could be detected. Nine of these twelve cases gave complete complement fixation, and eight gave a positive result with the opsonic test. Of thirty cases in which no definite evidence of active disease could be obtained, twenty-nine cases were completely negative to the complement-fixation test, and one incompletely positive, while one case only showed a diagnostic swing to the opsonic test (No. 31).

The series of cases which we have tested is comparatively small, but is, we think, representative of non-bacillary cases submitted to treatment, and in 70 per cent. of such cases we have been unable to demonstrate the presence of active disease. *Cases of active disease confined to an apex*, in which repeated examination of the sputum fails to demonstrate tubercle bacilli, appear to us to be much less common than is generally supposed. We have, in fact, only seen four cases of this type. Cases of apparently active disease of considerable extent and duration, in which bacilli cannot be found on repeated examination of the sputum, occur not infrequently, and it would be interesting to confirm the diagnosis by animal inoculation.

In a case showing a limited apical lesion without moist sounds, it does not seem to us justifiable to make a diagnosis of active disease on physical signs alone, if a repeated search for bacilli gives a negative result, or if no sputum is obtainable. The negative bacillary find should in such cases lead to a reconsideration of the diagnosis, and, if possible, the employment of other tests, before the patient is submitted to a prolonged course of treatment.

With positive opsonic and complement-fixation tests the time and discomfort to the patient involved in a subcutaneous diagnostic tuberculin test may be saved, but negative results by such tests have not, of course, a corresponding value in excluding activity.

Lastly, to judge from the series of cases tested by us, statistics based on supposed cases of pulmonary tuberculosis in which tubercle bacilli have not been found in the sputum must lead to grave fallacies in estimating both the results of any method of treatment and the prevalence of the disease.

DISCUSSION.

Dr. BATTY SHAW expressed his opinion that the paper should not be accepted without criticism. It was well known that a certain number of patients were being sent to our general hospitals, to our special hospitals, and to sanatoria as suffering from pulmonary tuberculosis, in whose sputa tubercle bacilli had not been demonstrated. He feared that if the authors' contribution was accepted without question, it would be considered right to acknowledge that if the above suspect cases gave a positive or negative result on the application of the subcutaneous tuberculin test, the complement fixation test or the opsonic index test, it followed that the suspicious signs found in the chest were or were not due to a tuberculous lesion. He submitted that even with suspicious signs in the chest a positive reaction to any of the above tests did not prove that such signs in the lungs were necessarily due to tuberculosis, and for the obvious reasons (1) that the patient so suspected might really owe his positive reaction to a tuberculous lesion in other site or sites than the lung, and (2) because, so far as he knew, no one had yet experimentally or clinically established the longevity of the special antibodies upon which depended the tests above cited. It was a familiar fact that the antibody whose existence made the Widal test for typhoid fever a possibility was only valuable when there were signs of an active infection as well, but this particular antibody could exist in the body years after the typhoid fever had subsided, so that supposing such an individual subsequent to his typhoid fever developed such a symptom as diarrhœa, and gave a positive Widal reaction, it would be wrong to conclude that such diarrhœa was due to typhoid infection. Until we knew how long the antibodies of tuberculosis could exist in the body after the tuberculous focus had ceased to exist it was, he contended, fallacious to rely upon the subcutaneous tuberculin test, the complement-fixation test and the opsonic index test as proofs of present and active tuberculosis. Then, with regard to the point raised by the authors of the paper, that supposing with the subcutaneous application of the tuberculin test a positive "local" reaction was given, and the "focal" signs were developed or increased in the lungs, we could assume that the lungs were therefore the seat of tuberculosis, he must say that his colleague, Dr. Thompson Rigg, had carried out on cases in the Brompton Hospital some work on these "focal reactions." Such observations were controlled ones, that is to say, not only were cases which were suspected of tuberculosis of the lungs observed after receiving provocative doses of tuberculin, but frank cases of tuberculosis of the lungs with tubercle bacilli present in the sputum were also observed for spontaneous changes independent of the use of tuberculin; further, non-tuberculous cases, such as cases of asthma, morbus cordis, aneurysm, &c., were observed for spontaneous changes in the signs in the lungs. It soon became apparent that the spontaneous changes occurring without the use of tuberculin were so frequent that it was impossible to make use of the "provocative" dose of tuberculin for the diagnosis of suspect pulmonary tuberculosis. The gist of his main criticism was that, so far as he knew, the longevity of the antibodies to tuberculous infection was not known, and he would be glad to hear from the authors whether they had any information on the point, as it seemed to him that the value of their paper depended upon the possession of such knowledge.

Dr. WESSELOW communicated the following, in reply to Dr. Batty Shaw's remarks: In the first place, we are quite prepared to admit the difficulty of detecting a focal reaction in the lung. Fortunately, in our negative cases—and it is on the large proportion of negative cases in the group that we are laying stress—conditions were as favourable as they well could be for detecting such a reaction. In the *negative* cases in which physical signs were present, we were dealing with limited apical lesions without moist sounds, and the appearance of moist sounds was taken as evidence of the presence of a focal reaction. The diagnosis of a focal reaction was confirmed in four cases by the appearance of bacilli in the sputum after the provocative dose (for the first time while under observation). With the occurrence of such a reaction, it appears from general observation to be justifiable to assume the presence of active pulmonary tuberculosis. As to the length of time during which the antibodies involved in these tests persist after the cure of the disease, it is not possible to speak dogmatically. The antibodies concerned in the tuberculin tests—subcutaneous and cutaneous—are known to persist with cured or latent disease, and it is for this reason that we have disregarded a febrile reaction to the subcutaneous test unless a focal reaction could at the same time be demonstrated. As to the complement-fixation test, the immune body has, in our experience, frequently been absent in cases in which cutaneous or febrile reactions to tuberculin could still be provoked. An abnormal opsonic index, apart from errors of technique, would appear to be invariably associated with active disease. Our object in bringing forward these cases was to point out the difficulty of determining the presence or absence of active disease in the non-bacillary group, and the high percentage of negative cases among the patients which we have investigated. The reliability of the other tests employed is, to some extent, proved by their consonance where they have been used in combination, and it would seem that, in the absence of bacilli from the sputum, these methods should be resorted to before a definite diagnosis is made.

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Medical Section.

April 28, 1914.

Dr. Samuel West, President of the Section, in the Chair.

Observations on CO_2 in Alveolar Air of Diabetics in relation to Onset of Coma: with Demonstration of Fridericia's Method of Measuring it Clinically.

By E. P. Poulton, M.D.

(PRELIMINARY COMMUNICATION).

Beddard, Pembrey, and Spriggs [1] were the first to show, by means of the Haldane-Priestley method, or some modification of it, that the partial pressure of CO_2 in the alveolar air falls with increasing acidosis, and during coma reaches a very low point, and when low can be raised by the administration of sodium bicarbonate. Confirmatory results have been made Straub [4], and by Fridericia [2], though the values they obtained were never so low as some of those obtained by Beddard, Pembrey, and Spriggs. Other Continental observers have established the same general conclusions by other methods.

In the course of some work on the true reaction of the blood in diabetes, I had occasion to determine the composition of the alveolar air in several patients [3]. Similar results were obtained to those just mentioned, and it seemed worth while to continue the work, in order to see if the results would be of value as a guide to prognosis and treatment in diabetes.

It was, in the first place, essential to use some apparatus suitable for clinical work; the previous work had been mostly carried out by means of Haldane's gas analysis apparatus, which is somewhat complicated. A very satisfactory apparatus has been devised by Dr. L. S.

Fridericia, of Copenhagen, which allows of determinations being made with a sufficient degree of accuracy within the space of ten minutes.[1]

Theoretical.—The value of alveolar determinations as a test of acidosis is based on the theory of neutrality regulation—i.e., the power of the organism to preserve the slightly alkaline reaction of its arterial blood at a nearly constant level. In diabetes, where there is an increased production of unusual acids, at least three mechanisms are brought into play to counteract their effect:—

(1) The acidity of the urine is increased.

(2) There is an increased formation of ammonia.

(3) The CO_2 percentage of the alveolar air is lowered.

It is the last factor which is particularly important in the present connexion, and which has only lately been realized owing to the work of Haldane, Barcroft, and Hasselbalch.

The venous blood gives off into the alveoli of the lungs its excess of CO_2, and this is prevented from accumulating by the respiratory ventilation. In health the latter is so adjusted that the percentage of CO_2 remains at a constant value, between 5 and 6 per cent. The arterial blood leaves the lungs saturated with CO_2 corresponding to its partial pressure in the alveoli. By the simple expedient of increasing the pulmonary ventilation, the percentage of CO_2 in the alveolar air will be diminished, without necessarily altering very much the actual quantity given off by the lungs, which depends solely on the body metabolism. Inasmuch as the alveolar CO_2 is lowered by this means, the amount contained in the arterial blood will be diminished—i.e., the arterial blood will become more alkaline.

In diabetes, when the acidosis is severe, the respiratory centre is stimulated, so that the pulmonary respiration is increased, and the diminution of CO_2 in the arterial blood compensates for the quantities of aceto-acetic acid and β-oxybutyric acid in the circulation. Hence the amount of CO_2 in the alveolar air changes inversely as the amounts of these unusual acids present, and thus it can be taken as a measure of the acidosis.

Summary of Results.—Observations have been carried out on fifteen patients during the last year, nine of whom died in coma. An analysis of the results shows that values of between 4 and 6 per cent. for the alveolar CO_2 are obtained in those cases where the acidosis is small in amount or else completely absent. These are the milder cases which are in no danger, at any rate for the time being, of passing into coma. Values of between 2·5 and 3·5 per cent. represent a more dangerous state, although under the most unfavourable conditions coma will not supervene within less than forty-eight hours. Values of below 2·5 per cent. indicate the early onset of coma, possibly within forty-eight hours, unless drastic measures are taken. In one case the alveolar CO_2 was found to be 2·35 per cent. (mean of two determinations), and as a result of administering 2½ oz. of sodium bicarbonate *per os*, in the twenty-four hours, the percentage rose to 4·4. The diet contained 4 oz. of carbohydrate. In this case the coma was temporarily averted; death occurred a month later. In three cases the alveolar air was actually analysed during coma, being collected by the Hasselbalch method; the values obtained were 1·0, 0·9, and 1·5 per cent.

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[1] I understand that it can be obtained of Messrs. Paul Altmann, Luisenstrasse, Berlin. The apparatus I have used was made for me by the Scientific Glassblowing Co., Red Lion Passage, Red Lion Square, High Holborn.

Advantages of the Method.—Another method that has been used to estimate the acidosis in diabetes is the determination of the total quantity of ammonia excreted during twenty-four hours in the urine. This is often impossible to accomplish in an urgent case seen for the first time. An expedient sometimes adopted is to determine the ratio of the ammonia to the total nitrogen in a sample of urine. However, the results by this method are often uncertain, owing to variations in the nitrogen content of the food. But there is the possibility of error from another cause. The ammonia of the urine depends first on its production in the body, and secondly on its excretion by the kidneys. If either of these functions is disturbed, the values obtained will fail to give a true estimate of the acidosis. On the other hand, alveolar air determinations have the great advantage of indicating the actual state of acidosis of the blood at the time, owing to the extreme sensitiveness of the respiratory centre to excess of acid. Fridericia's method can be easily and rapidly carried out, and the results are sufficiently accurate for clinical work.

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[1] Beddard, Pembrey, and Spriggs. *Journ. of Physiol.* (Proc. Physiol. Soc.), 1904, xxxi, p. xliv.

[2] Fridericia. "Tidskrift for Terapi," Copenhagen, 1913.

[3] Kennaway, Pembrey, and Poulton. *Journ. of Physiol.* (Proc. Physiol. Soc.), 1913, xlvii, p. x.

[4] Straub. *Deutsch. Arch. f. klin. Med.*, 1913, cix, p. 223.

DISCUSSION.

Dr. CAMMIDGE said that the method Dr. Poulton had demonstrated appeared likely to be of considerable value, for it enabled one to determine with ease and rapidity a figure which was correlated to the degree of acidity existing in a diabetic at any particular time. This, considered in conjunction with the result of an estimation of the sugar content of the blood by one of the rapid methods now available, placed one in a much better position for diagnosing and classifying cases of glycosuria seen for the first time or under circumstances where a twenty-four-hour specimen of urine could not be obtained. The determination of the degree of acidosis by analysis of the urine, even when a twenty-four hours' sample was available, was not by any means an ideal method; the direct estimation of the acetone bodies was much too long a process to carry out as a routine, while the indirect method of inferring the acidosis from the amount of ammonia nitrogen present was open to several objections. In the first place, ammonia was not the only base with which the acids present in the blood of diabetics combined, calcium and magnesium being largely used in some cases, especially when tuberculosis was associated with diabetes; secondly, the titration method of Malfatti included the amino-acids as well as the ammonia. In some cases of diabetes the amino-acid nitrogen might constitute half the so-called ammonia nitrogen as measured by this method, leading to a very incorrect conclusion as to the acidity. In his opinion, however, the amino-acid content of the urine was quite as important from the point of view of prognosis as the quantity of acetone bodies, but they should be separately estimated. One drawback to the method Dr. Poulton had demonstrated appeared to be that some experience and practice were required to obtain a reliable sample of the alveolar air, so that with children and nervous or stupid patients misleading results might be given. From what he had been able to gather from the charts shown on the screen it would seem that a fall in the CO_2 content of the alveolar air which the author of the paper regarded as dangerous occurred only a short time before the onset of coma, and often with comparative suddenness, whereas a comparison of the results of regular daily analyses of the urine generally gave considerable warning of a tendency in that direction. The administration of alkalis obviously influenced the result, but he would like to know whether muscular activity, the nature of the diet, the time at which food was last taken before the observation was made, and the type of individual, also affected the result, since the work of Benedict and Joslin and others had shown that these were important factors in determining the output of CO_2 and the consumption of oxygen in diabetes.

Dr. GEORGE GRAHAM said that he had used the clinical method described by Dr. Poulton and had found it easy to work with. He had not yet examined a sufficient number of cases of diabetes to be able to draw any conclusion from his results.

Dr. POULTON, in answer to Dr. Cammidge, said he would like to refer to Hasselbalch's work.[1] He had shown that the alveolar CO_2 in healthy individuals at different times of the day was remarkably constant, and this was the case whether the subject was taking an ordinary mixed diet or non-carbohydrate diet, or a vegetable diet. He (Dr. Poulton) was unable to say whether the same constancy occurred in severe cases of diabetes, but in one case he investigated there were remarkable variations in the alveolar CO_2 on successive days. Change of diet produced an undoubted effect on the alveolar CO_2 of healthy individuals. In one case the percentage was 4·5 on a non-carbohydrate diet, and this rose to 5·5 on an ordinary mixed diet. In severe diabetes the changes might be still more marked, as was indicated by the fact that coma might supervene in cases where the diet was too rigid. However, the possible variations in the alveolar CO_2 did not much matter if the alveolar air was to be taken as a guide to prognosis and treatment, because, according to the theory sketched in the paper, the alveolar CO_2 gave a measure of the actual acidosis present in the blood at the time, and this was what must be treated. If the alveolar CO_2 was very low the appropriate measures should be taken, such as the addition of carbohydrate to the diet and the administration of sodium bicarbonate. It had often been stated that the body endeavoured to neutralize its acidosis by the excretion of an excess of calcium sodium and potassium salts in the urine. Such an excretion undoubtedly occurred, but it must be very ineffective from the neutralizing point of view, as if the bases arose from a neutral salt in the organism, an equivalent amount of acid must remain behind, which must itself be neutralized by the organism. In fact, it would seem that the only effective salts to utilize would be carbonate, as the remaining CO_2 would be removed by the lungs; but this occurred when the pulmonary ventilation was increased and the alveolar CO_2 was lowered; so that it was possible that the increased output of inorganic bases was only the expression of the lowered alveolar CO_2, a subject which had already been discussed. In one case Dr. Kennaway estimated the total acetone bodies. These figures had been published already.[2] The method used was a modification of Schäffer's method.

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[1] *Biochem. Zeitschrift*, Berl., 1912, xlvi, p. 403.

[2] Loc. cit.

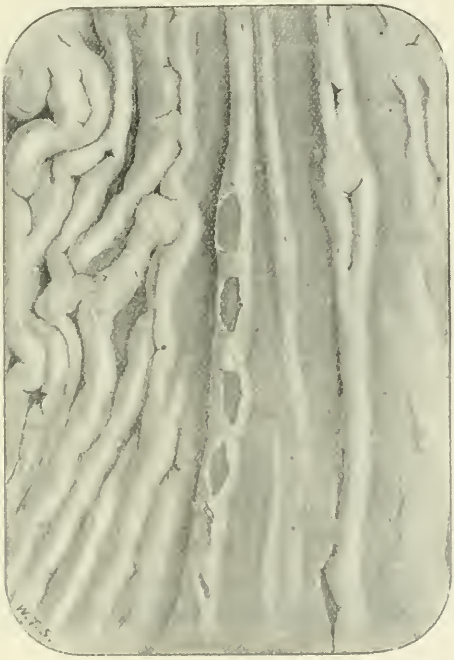
Multiple Acute Ulceration of the Stomach.

By F. Parkes Weber, M.D.

In the present case I had not expected to find anything remarkable in the stomach after death. The finding of the acute ulcers was quite a surprise.

The patient, Mrs. L. E., aged 47, was admitted to the German Hospital on February 5, 1914, in a very feeble, cyanosed and dyspnœic state, not unconscious, but with her sensorium somewhat dulled. The history was that for twenty years she had been subject to winter cough and bronchitis, and that she had been more or less constantly ailing for the past two years. In June, 1913, she had been knocked down in the road by a cyclist. The present illness was said to have commenced with bronchitic symptoms about two weeks before admission. No special gastric symptoms had been noted, and there was no history of hæmatemesis, epistaxis, hæmoptysis, or melæna. In the Hospital sharp crepitations were heard over the upper front part of the right lung. The other organs of the thorax and abdomen showed nothing remarkable. There was some œdema of the feet. The urine was scanty, and contained a trace of albumin; no sugar. The respirations varied between 44 and 60 per minute, and the pulse between 112 and 130. The body temperature was never above 99° F., and never below 97° F. In spite of treatment (oxygen inhalation, digalen, diuretin, ipecacuanha, subcutaneous injection of camphor oil) the patient died on February 7, about forty-two hours after admission.

Necropsy (February 7, 1914): The head could not be examined. The upper part of the right lung was found to be in a condition of "tense œdema." There was some fresh pleuritic adhesion on the right side, with about 300 c.c. of clear serous pleuritic effusion. Microscopical sections of the affected part of the lung showed catarrhal and extreme emphysematous changes, and the presence of coagulated œdema fluid in the pulmonary vesicles made the sections appear under the microscope as if they had been cut in celloidin. No Gram-positive organisms were found. The right side of the heart was somewhat engorged. The spleen was of average size, and of rather hard than soft consistence. The kidneys were congested. In the liver there was a transverse groove across the lower part of the front, such as is caused by "tight lacing," and microscopically there was evidence of chronic passive congestion. In the remaining organs nothing specially noteworthy was observed, excepting in the stomach. There was no ascites, and from the outer side (before it was opened) the stomach did not appear to be diseased. On opening it the mucous membrane was seen to be hyperæmic and thrown into longitudinal folds or "rugæ" by the contracted state of the muscular walls of the organ. There were no submucous or subserous hæmorrhages (nor was there any pus such as may be found in cases of "phlegmonous" gastritis). The unexpected feature was the presence of a great number of sharply cut ("punched-out") ulcers in the mucous membrane (*see* figure). At least 100 of these ulcers were counted, but there had probably been considerably more, as some of them appeared to have been formed by the coalescence of two or more smaller ones. They were distributed over all parts of the gastric mucosa, but were



Internal surface of a portion of the wall of the stomach (natural size). To show the multiple acute gastric ulcers. Notice the tendency towards arrangement in longitudinal lines on the rugæ, or elevated folds of mucous membrane over the contracted walls of the stomach.

chiefly arranged in longitudinal lines on the projecting ridges or folds (rugæ). Some of them formed uneven slit-like depressions of considerable length on the convexity of these ridges. Some of the longer (linear) ulcers were possibly formed by the coalescence of smaller ones, but their slit-like appearance was doubtless in part due to the state of circular contraction of the muscular walls of the stomach. In the first part of the duodenum there was some hyperæmia, but no ulceration.

Microscopical examination of two of the ulcers in the stomach showed that they were superficial, the deepest part of the gastric mucosa remaining undestroyed and forming the ulcer floor. The mucous membrane, especially the ulcerated region, was moderately infiltrated with lymphocytes and polymorphonuclear cells, proving the ante-mortem nature of the change. The ulcers were, however, doubtless acute, as no signs of chronic inflammation were observable. No Gram-positive organisms were found in the sections.

There can be no doubt that the *multiple acute superficial ulcers* were in the present case of recent formation. They constituted, in fact, practically a "terminal" phenomenon, and probably both they and the local pulmonary œdema were due to the same infective agent (whatever the microbe in question might have been). Dr. Charles Bolton, in his recent work on "Ulcer of the Stomach,"[1] refers to two cases of multiple acute gastric ulceration, of infective origin, at University College Hospital. In the stomach of one of these patients 431 ulcers, or lesions about to become ulcers, were found, whilst in the other patient's stomach there were about 250.

I am indebted to my house physician, Dr. Sons, for much help in the examination of the present case, and to Mr. S. G. Shattock for kindly assisting me in the microscopical examination.

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[1] London, 1913, p. 24.

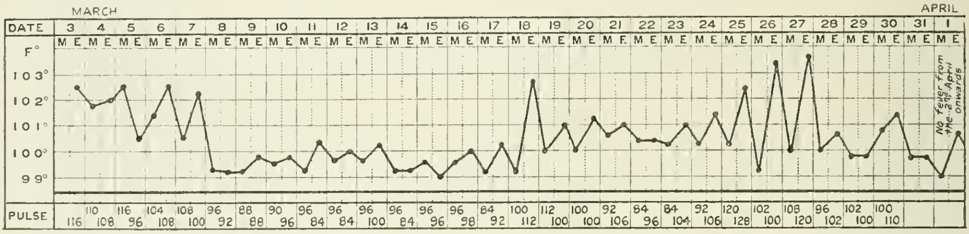
Acute Aplastic Anæmia: With a Note on the Nomenclature of Plastic and Aplastic Anæmias.

By F. Parkes Weber, M.D.

The patient, E. B., aged 18, a German watchmaker in London, was admitted under my care at the German Hospital on March 3, 1913, suffering from stomatitis. He had enjoyed good health up to the commencement of his present illness. Five weeks before admission he had had a "cold" and cough, but did not feel ill with it. On February 24, however (seven days before admission), he suddenly began to feel ill with a sensation of "heaviness" in the head and "swelling" in the mouth. I have been told by someone who knew him that up to this time he did not look at all pale, but, on the contrary, had a "good, healthy complexion." A doctor who saw him four days before admission found that he had fever, and ordered a medicine and a mouth-wash. The patient had of his own accord already taken some aspirin tablets. The mouth condition seemed to have caused little pain, though he did not take hard food or anything likely to excite pain in the mouth.

Condition in the hospital: The patient was a well-developed but pasty-looking young man, with stomatitis, chiefly about the gums, which were spongy and tended to bleed readily. The tongue was much coated, and there was *fœtor ex ore*. The tonsils appeared normal, and the lymphatic glands under the jaw and in the neck were very little, if at all, enlarged. Nothing abnormal was discovered in examining the thorax, abdomen and urine. There was no history of the patient having taken mercury or bismuth, and there was no evidence of syphilis. The blood serum (March 18, 1913) gave a negative Wassermann reaction for syphilis. On admission the temperature was 102·6° F., pulse 116, and respirations 28 per minute. Fever of an irregular kind persisted till April 2 (*see* chart), after which the temperature remained low. Repeated examinations of the patient's blood (*see* Tables A and B) showed progressive anæmia with no (or hardly any) signs of hæmopoietic reaction; that is to say, the anæmia was of an "aplastic type."

During the latter part of March a painful swelling developed in the right side of the face, and a small necrotic patch was found in the mouth, or rather in the buccal cavity (right side), just outside the lower jaw. This area was incised by my surgical colleague, Dr. E. Michels, on March 25, and a little thin fluid (inflammatory œdema?) escaped from the incision. A small piece of tissue for microscopical examination was removed. The microscopical sections showed striped muscle tissue; most of the muscle-fibres had lost their transverse striation, many of them had a swollen ("varicose") appearance, and tended to longitudinal splitting; many others had undergone typical hyaline degeneration; in some parts of the sections there was considerable inflammatory cell infiltration; no Gram-positive organisms were found. Some of the patient's blood taken on March 29 was cultivated at the Lister Institute for microbes, but only a few staphylococcic colonies (contamination?) grew on the plates. A film of fluid from inside the right cheek (April 1), examined by Dr. J. C. G. Ledingham at the Lister Institute, contained enormous numbers of spirochætes and some other organisms.



Temperature and pulse chart during the pyrexial period.

After the incision in the cheek (on March 25) the temperature rose higher for three days (once up to 103·6° F.), but then the fever gradually subsided, and there was none after April 2 (*see* chart). As mouth-washes solutions of peroxide of hydrogen and of chlorate of potassium were used. Fragments of slough came away after the incision, but by April 3 the mouth had healed up, though there was still some induration in the right cheek. This gradually disappeared completely, but the anæmia increased in spite of the improvement in the condition of the mouth.

Treatment at first had been directed mainly to the mouth and the general febrile state, but after the blood examination of April 1 (*see* Table B) I made an intravenous injection of salvarsan (0·2 grm.), which was followed by no disagreeable symptoms. After the blood examination of April 5 (*see* Tables A and B) I made a further intravenous injection of salvarsan (0·1 grm.). The blood showed more extreme anæmia, but

TABLE A.—BLOOD EXAMINATIONS BY DR. BAUCH.

Date	Red cells per cubic millimetre of blood	Hæmoglobin per cent.	White cells per cubic millimetre of blood	Lymphocytes per cubic millimetre of blood	DIFFERENTIAL COUNT OF WHITE CELLS PER CENT.						Remarks
					Lymphocytes	Monocytes	Polymorphonuclear neutrophiles	Eosinophiles	Mast cells	Myelocytes	
March 13, 1913	3,500,000	--	2,000	1,494	74·7	3·1	16·0	1·5	4·7	0	The red cells appeared normal in blood films examined on March 10
March 27 ...	1,200,000	15	2,100	1,168	55·6	2·7	41·7	0	0	0	No erythroblasts seen; no poikilocytosis, anisocytosis, or polychromatophilia
April 5 ...	785,000	15	2,000	982	49·1	1·9	49·0	0	0	0	One erythroblast (a normoblast) seen; slight anisocytosis; no poikilocytosis or polychromatophilia
April 10 ...	1,000,000	10	2,500	1,550	62·0	0·8	36·4	0·8	0	0	One erythroblast (normoblast) seen, and one erythrocyte with punctate basophilia; some anisocytosis; slight polychromatophilia; no poikilocytosis
April 19 ...	880,000	10	1,850	814	44·0	2·0	54·0	0	0	0	—
April 29 ...	880,000	10	3,500	1,519	43·4	2·4	50·9	1·0	0	2·3	One erythroblast (normoblast) seen; some anisocytosis, but no poikilocytosis; very little polychromatophilia

TABLE B.—EXAMINATION OF BLOOD FILMS BY DR. G. R. WARD.

Date	DIFFERENTIAL COUNT OF 500 WHITE CELLS							Remarks
	Polymorphonuclear neutrophiles	Eosinophiles	Mast cells	Transitionals	Small mononuclears	Large mononuclears	Myelocytes	
April 1, 1913	32·4	0·6	0·4	1·8	63·4	1·4	0	No erythroblasts seen; red cells were of average normal size; no poikilocytosis; very few blood platelets; many of the lymphocytes were very small and had almost no visible cytoplasm; a few were larger and vacuolated, and some were still further degenerate ("basket cells")
April 5 ...	27·8	1·4	(One seen)	3·8	63·6	3·0	0·4	A few erythroblasts (normoblasts) present (eight to the cubic millimetre of blood); some anisocytosis; very few poikilocytes seen; few blood platelets
April 10 ...	25·2	0·6	0·2	5·4	66·4	1·6	0·6	No erythroblasts seen; anisocytosis considerably increased; very little poikilocytosis; some polychromatophilic megalocytes, &c.; very few blood platelets; the lymphocytes showed nucleolus
April 19 ...	18·2	0·8	0	5·2	73·2	2·2	0·4	No erythroblasts seen; less anisocytosis than before; no poikilocytosis; slight polychromatophilia; very few blood platelets
April 29 ...	50·0	0·4	0	3·0	45·6	0·8	0·2	A few erythroblasts present (seven to the cubic millimetre of blood); some anisocytosis; very few poikilocytes seen; some polychromatophilia; very few blood platelets

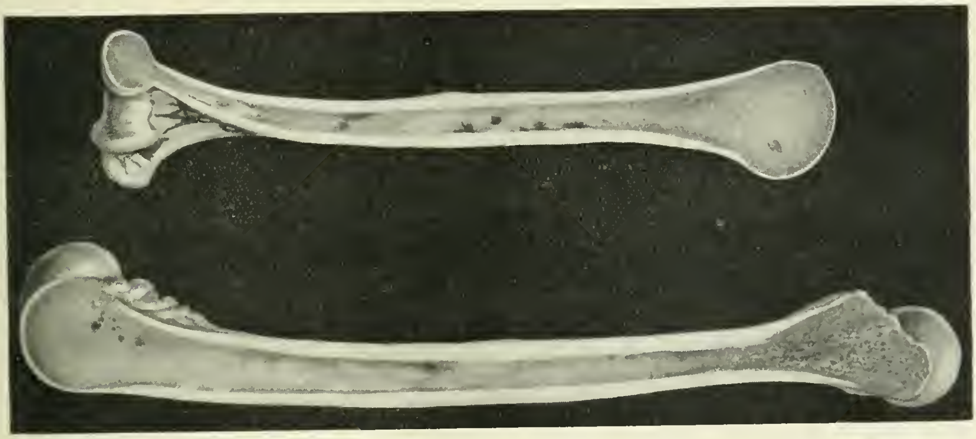
likewise signs of very slight myeloid reaction (a feeble attempt at blood regeneration), possibly due to the salvarsan previously injected. On April 10 (*see* Tables A and B) the red cell count had risen slightly (to one million in the cubic millimetre of blood), and there were again signs of a very little myeloid reaction (presence of a considerable number of polychromatophilic megalocytes). On that date I gave another intravenous injection of salvarsan (0·2 grm.). There was at that time hardly any induration remaining in the patient's right cheek, and he could open his mouth fairly well. On April 19 I gave a fourth intravenous injection of salvarsan (0·2 grm.). But the blood examination of that date (*see* Tables A and B) showed a diminution of the red cells (880,000 per cubic millimetre of blood), and, unfortunately, practically no signs of blood regeneration. No further salvarsan was given. The condition of the mouth had long been apparently quite healthy again, but the patient was complaining of some difficulty in hearing, and on April 21 an ophthalmoscopic examination (Dr. R. Gruber) showed neuro-retinitis with retinal hæmorrhages in both eyes. From April 19 there was a good deal of vomiting, and this soon became the most urgent symptom, and led to great difficulty in feeding him. On April 29 (*see* Tables A and B) the erythrocyte count was the same as on April 19, but the white cells had increased from 1,850 to 3,500 per cubic millimetre of blood, and there were again definite signs of an attempt, though a very feeble attempt, at blood regeneration. There were no signs of any spinal cord disease. The knee-jerks, Achilles-jerks, and plantar reflexes were normal.

On May 5 the patient complained of abdominal pain and then developed dyspnœa. In spite of stimulants, inhalation of oxygen, &c., he died in the evening, after an illness of ten weeks (dating the commencement from February 24). The last specimen of urine showed a trace of albumin; no acetone. The pulse, which from the day of admission had been nearly always over 100 per minute, was 124 on the morning of the last day. The patient had had no fever since April 2.

NECROPSY AND MICROSCOPICAL EXAMINATION.

The body and the viscera were very pale. In the brain (weight 55 oz.) nothing abnormal was found. The heart (weight 14 oz.) showed a little hypertrophy of the left ventricle; fatty "tigering" was noticeable under the endocardium. At the apices of both lungs there was old fibrosis, with spots of calcification; both lungs were œdematous; the right pleura was adherent. The peritoneum appeared healthy. The liver weighed 48 oz., and appeared somewhat browner than usual, but of normal consistence. The gall-bladder contained dark bile; there were no gall-stones. Microscopically the sections of the liver gave a well-marked "Prussian blue reaction" for the presence of free iron (treated with dilute hydrochloric acid and potassium ferro-cyanide), but otherwise showed nothing abnormal. The spleen was small, weighing only 2¼ oz. and measuring 3¾ by 2¾ by 1 in.

Microscopically, the sections gave a decided "Prussian blue reaction" for the presence of free iron; there was a good deal of pigment deposit; the trabeculæ had an atrophic appearance, being poor in nuclei. In the kidneys (weight together 12 oz.) there was, by macroscopic and microscopic examination, no evidence of nephritis, or of fibrosis, or of any disease. A minute suprarenal "rest" (microscopical examination), about the size of half a very small flattened pea, was adherent to the cortex of one kidney. The pancreas, macroscopically and microscopically, showed nothing abnormal. The suprarenal glands, thyroid gland, urinary bladder and testes appeared healthy. Practically no remains of the thymus were seen. The mesenteric and other abdominal lymphatic glands were not enlarged; they were rather pale, and none of them were red in colour (as they have sometimes been observed to be in



The left humerus and the right femur sawn through longitudinally—to show the macroscopic appearance of the bone-marrow.

leukæmic and other cases); nor were any lymphatic glands elsewhere obviously enlarged. Microscopic sections of a mesenteric lymph gland and of one from close to the aorta showed nothing abnormal. No malignant or other tumour was found anywhere. Nothing special was noted in the alimentary canal; no ulceration; no intestinal worms. Microscopic sections of the stomach, the small intestine (ileum), and the large intestine (from near the cæcum) showed no sign of disease.

The left humerus and the right femur were removed from the body and sawn through longitudinally. The bone-marrow was almost entirely of the pale yellow fat kind (*see* figure), but the sawn surface of the upper end in both bones had a slight reddish-brown tinge (as if a little hæmopoiesis had been going on there); in the diaphysis-marrow there were a few red spots (notably in the humerus). Microscopic examination of the bone-marrow from a part of the right femur where macroscopically there appeared to be some blood formation going on, showed fatty tissue, with groups of cells interspersed between the fat vesicles, representing the hæmopoietic elements. The bones of a person in the equilibrium of perfect health, without any special call on his hæmopoietic functions, would, I suppose, have contained far more active blood-forming tissue than the bones of this man did, upon whom such an urgent demand for new blood cells was being made. In specially stained sections (May-Grünwald and Giemsa stains) it is evident that, apart from the fat cells and erythrocytes nearly all the cells are erythroblasts, though a large proportion of them consist of a nucleus (resembling that of a normoblast) with hardly any visible cytoplasm surrounding it. Some of them are megaloblasts, and many of them have polychromatophilic or basophilic cytoplasm. Besides these erythroblasts there is a fair sprinkling of mononuclear eosinophilic cells, which I suppose represent the myelocyte series, though their nuclei are not unlike those of the erythroblasts. Here and there megakaryocytes are seen.

I have to thank all those who have assisted me in the study of the present case, particularly Dr. Bauch and Dr. W. Solmitz, at the German Hospital; Dr. G. R. Ward, for his kind reports on the blood films, and for references to the literature of the subject; and Dr. J. C. G. Ledingham and Mr. S. G. Shattock for help in regard to microscopical examinations.

REMARKS.

The chief points of the case may be summed up as follows: A young man, who had previously enjoyed apparently fair health, though he had (as the necropsy showed) formerly had a slight tuberculous affection of the apices of the lungs, suddenly contracted some kind of microbic infection of the mouth, showing itself by gingival stomatitis, a phlegmonous induration of the right cheek, and considerable pyrexia. From all this he completely recovered, but with the onset of the mouth disease there was associated a grave form of anæmia, which proved rapidly progressive, and, in spite of the improvement in his mouth condition, ended fatally in ten weeks from the apparent onset. This anæmia differed from typical so-called "pernicious anæmia," and from grave secondary anæmias, in its being much more pernicious and much more rapidly fatal. Blood examinations showed the almost complete absence of any "megaloblastic reaction," and of the blood-regenerative changes, generally so much dreaded as a characteristic sign of the presence of pernicious or of grave secondary anæmias. In the present case poikilocytosis, anisocytosis and polychromatophilia were absent or only slightly marked, even when the total number of erythrocytes fell to below one million in the cubic millimetre of blood. There was never decided megalocytosis, and still less was there any megaloblastic reaction such as is characteristic in pernicious anæmia; in fact, there were few megalocytes, and nucleated red cells (erythroblasts) were almost completely absent. The colour index of the red cells varied greatly (from about ½ to 1), but it was usually much lower than 1 instead of being higher than 1, as it would probably often be in characteristic cases of pernicious anæmia. Simultaneously with the fall in the red cells there was likewise a great reduction in the number of the white cells (leucopenia), which were only about 2,000, instead of the normal 5,000 to 8,000, in the cubic millimetre of blood. Of the white cells the lymphocytes were least affected, and all the differential counts of white cells showed a decided relative lymphocytosis, but this was *only* relative, for the total lymphocytes numbered only 814 to 1,550 in the cubic millimetre of blood, instead of the normal average—namely, about 1,400 to 2,000. The white cells particularly reduced in number were those derived from the bone-marrow, notably the polymorphonuclear neutrophiles, which at one count numbered about 1,000, instead of the normal 4,000 to 6,000, in the cubic millimetre of blood. The quantity of blood platelets was decidedly diminished below the normal standard. The clot which forms in the watery blood from cases like the present one is said by French observers not to retract normally, but I did not test this in the present case.

The main features of the disease are accounted for as those of an anæmia due to blood destruction, almost entirely unaccompanied by conservative blood-regenerative changes on the part of the hæmopoietic tissue of the bone-marrow. The condition may therefore justly be termed, as it is termed, "acute aplastic anæmia." Whether the very slight signs of regenerative hæmopoietic reaction observed in the present case were induced by the salvarsan injections or not it is impossible to say. Genuine examples of acute aplastic anæmia are probably invariably rapidly fatal like the present one, but conditions of chronic aplastic anæmia, characterized by a variable chronic anæmia with deficient signs of blood regeneration, likewise exist, which belong to a different category.

One suggestion is that cases of acute aplastic anæmia like the present one are due to the initial infection being of a peculiar nature, the resulting toxins in the blood having the power to more or less completely paralyse or destroy the hæmopoietic functions of the bone-marrow. But the initial infection need apparently not always be a severe one, and it can obviously be argued that the severity and peculiar fatal character of acute aplastic anæmia is due to some preceding, though possibly hitherto latent, peculiarity of the affected person, a peculiarity manifesting itself by the inability of his hæmopoietic bone-marrow to react efficiently in response to even moderately urgent demands on it. Be that as it may, whether the condition is due to some exceedingly virulent septic infection or to some unknown and rare infection (which has the power of paralysing or destroying the hæmopoietic functions of the infected individual), or is due to any idiosyncrasy or a temporary or chronic peculiarity (deficiency in hæmopoietic response) on the part of the affected individual, the clinical features of a case of "acute aplastic anæmia" are sufficiently striking to give it a place by itself amongst the rarest diseases or symptom-complexes of the blood and blood-forming apparatus.

This rapidly fatal kind of "aplastic anæmia" might well be termed "Aplastikæmia."[1] On the other hand, the chronic form of aplastic anæmia to which I have already alluded might be called "Hypoplastikæmia," since it is really a chronic hypoplastic anæmia, due to congenital or acquired inability of the hæmopoietic tissues (under normal or slightly pathological conditions) to maintain the normal standard of blood quality (blood equilibrium); in other words, the hæmopoietic tissues in such chronic cases give a deficient regenerative response to normal and pathological stimuli.[1] Other anæmic cases of various kinds showing the ordinary characteristics of blood regeneration (cases of "plastic" anæmia as opposed to "aplastic" or "hypoplastic" anæmia) can, of course, be divided into groups which might, by the same method of nomenclature, be headed "Orthoplastikæmia" and "Metaplastikæmia." Ordinary "pernicious anæmia" with so-called "megaloblastic reaction" of the bone-marrow furnishes characteristic examples of "Metaplastikæmia," whilst simple anæmia caused by hæmorrhage and showing signs of normal blood regeneration supplies us with the standard types of "Orthoplastikæmia."

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[1] The terms "Aplastichæmia," "Hypoplastichæmia," "Hyperplastichæmia," &c., would be more correct, but if one were to adopt such spelling one would be compelled to write leuchæmia instead of leukæmia, and the medical authors who write "leuchæmia" are decidedly in the minority.

These conditions of "aplastikæmia," "hypoplastikæmia," &c., may furthermore be contrasted to a state of what might be termed temporary or permanent "hyperplastikæmia," including cases of erythræmia[2] (polycythæmia rubra) and some cases of erythrocytosis (secondary polycythæmia rubra), in which the hæmopoietic response of the bone-marrow to normal and pathological stimuli is excessive.

It is, of course, obvious that the conditions of aplastikæmia and hypoplastikæmia which I have discussed must be thoroughly distinguished from conditions of hypoplastikæmia occurring as terminal phenomena in various diseases and due to *exhaustion of the hæmopoietic functions* of the bone-marrow, whether such exhaustion be or be not associated with the post-mortem finding of definite anatomical (so-called) "gelatinous" or "mucoid" degeneration of the bone-marrow.[1]

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[1] To this condition of chronic aplastic anæmia, or hypoplastikæmia, certain conditions of quiescent "compensated" anæmia may be contrasted—conditions met with when more or less of the original cause (whatever it may be) of the anæmia persists, though the actual oligocythæmia is no longer present, having been overcome or "neutralized" by a compensatory hæmopoietic response on the part of the bone-marrow. Thus, in certain patients with chronic enlargement of the spleen, who have shown all the signs of splenic anæmia, the oligocythæmia may (with or without special treatment) disappear, having been "neutralized" by the hæmopoietic reaction on the part of the bone-marrow, though the splenomegaly and leucopenia persist. The prognosis in such cases requires to be diligently worked out. Will a condition of Banti's disease, with (splenogenic) cirrhosis of the liver and ascites, ultimately develop or not? Ought splenectomy to be attempted in all such early cases or not, before the patient's general health has suffered severely? In the intervals between attacks (exacerbations) of pernicious anæmia the oligocythæmia may more or less disappear, though some poikilocytosis, anisocytosis (or megalocytosis), and polychromatophilia, may remain, giving rise to a blood-picture which H. R. Hurter has designated as one of "compensated pernicious anæmia."

[2] In regard to the blood-picture and the state of the bone-marrow, erythræmia and aplastic anæmia have been well contrasted together by H. R. Hurter.

Note.—As the hæmopoietic mechanism in the bone-marrow does not in reality come to a perfectly complete standstill, some critics on nomenclature might object to the term "aplastic" as applied to any cases. In deference to such critics, cases of "acute aplastic anæmia" might be termed "acute hypoplastic anæmia," whilst cases of "chronic aplastic anæmia" would naturally be distinguished as "chronic hypoplastic anæmia." One might then speak of a state of *acute* or *chronic*) *hypoplastikæmia*, but not of aplastikæmia.—F.P.W.

Dr. W. E. WALLER said that Dr. Parkes Weber's paper had been of particular interest to him as he had recently had the opportunity of observing two cases of grave anæmia in which the marrow reaction was defective. Both these cases were under Dr. Rolleston's care at St. George's Hospital, and Dr. Rolleston had very kindly given him permission to mention them. During the preceding ten years, out of a series of eighteen cases of pernicious anæmia who had died in St. George's Hospital whilst under observation, in these two only was the marrow defect prominent. The first case occurred in a male patient, aged 19, and the course of the disease was about three months, the chief symptom being progressive weakness. On admission on October 26, 1913, he was well nourished, the spleen was palpably enlarged, and hæmorrhages were limited to the retina. The blood examination showed 1,408,000 red cells, a colour index of 0·89, and a total of 2,760 white cells, of which 26 per cent. were polymorphonuclears, 72 per cent. lymphocytes, and the remaining 1 per cent. eosinophiles and large mononuclears. The red cells showed slight poikilocytosis, but no polychromatophilia, and no nucleated forms were present. On November 14 the red cells had fallen to 832,000 and the white cells to 1,020, of which 16 per cent. were polymorphonuclears and 84 per cent. lymphocytes. He died on November 16. The autopsy showed the usual fatty changes associated with grave anæmias. The rib-marrow was scanty, chiefly localized about the angles, and had a normal appearance, whilst that of the sternum and diaphysis of the femur was reddish-brown and very fluid. The microscopical character was the same in each case, a fairly well marked leukoblastic reaction but very little erythroblastic reaction. The spleen, liver, and kidneys gave Perle's test for free iron, and in addition the liver showed slight cirrhosis with a unilobular distribution. There was no trace of leukæmic infiltration. The second case was a male patient, aged 42, and the duration of the condition was about five months. He was admitted in January, 1914, in the last stages and only lived for ten days, during which period one blood examination was made. This showed 860,000 red cells, a colour index of 1·5, and 5,200 white cells, of which 24 per cent. were polymorphonuclears and 75 per cent. lymphocytes. There was some poikilocytosis, whilst some normoblasts were present. The autopsy in this case showed that the rib-marrow was red, plentiful, with a well-marked megaloblastic reaction, whilst that from the femur was markedly aplastic, mostly fatty, and with a few minute red foci in which active blood formation was proceeding. Although there was some effort at regeneration in this case, nevertheless the clinical course and post-mortem appearances suggested a grave hæmopoietic defect.

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[1] The old term "myelophthisis" should not be applied to this degeneration of the bone-marrow, as it has been used for tabes dorsalis and degenerative diseases of the spinal cord.

A Pedunculated Intra-bronchial Tumour (Sarcoma) causing Bronchiectasis.

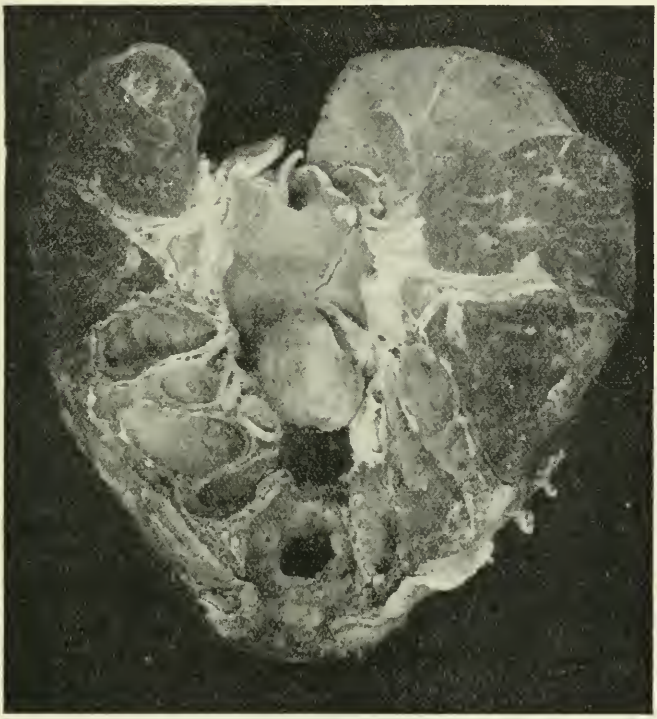
By J. A. Braxton Hicks, M.D.

E. H., aged 33, complained of cough, profuse expectoration, and occasional blood-spitting. Her family and personal history were unimportant, there being no history of tuberculosis or cancer in her immediate relatives. At the age of 20 she became a nurse at the Cheyne Hospital, Chelsea, and she had to leave there in 1900 on account of a "severe attack of anæmia." She next became a school nurse under the Poor Law Authorities at Parsons Green, Sutton and Hanwell. At Parsons Green she had a transient attack of pleurisy; at Hanwell she had her first attack of hæmoptysis. She then left off nursing, and became first an out-patient and then an in-patient of the Mount Vernon Hospital, and later entered the Hampstead and Northwood Sanatorium. During this time she had had numerous slight attacks of hæmoptysis, but while at Northwood she had such a severe attack that her life was despaired of, but she eventually recovered. In 1902 she was for a while a private patient of Dr. F. T. Hebb, to whom I am indebted for the notes of the early stages of her illness. Her condition for the next eight years was variable, but slowly downhill, and in May, 1910, she was admitted to the Westminster Hospital, under the care of Dr. R. G. Hebb, to whom I am much indebted for permission to publish the case.

On admission she was thin and pale. The skin was moist; the legs œdematous, and the fingers "clubbed." Both knee-joints were much swollen and slightly painful. The temperature varied between 96° and 99° F. daily. She had repeated fits of coughing, with copious expectoration of purulent sputum. This sputum contained streptococci, pneumococci and *Micrococcus catarrhalis*, but tubercle bacilli were not found after the most thorough search. It is worthy of note here that tubercle bacilli never had been found in the sputum, when examined at the Brompton or Mount Vernon Hospitals, or the Northwood Sanatorium. On examination of the chest the right side was seen to be sunken in, and to move badly on respiration. Vocal fremitus was increased all over the right side, which was quite dull on percussion. All kinds of added sounds could be heard on auscultation, and at times well-marked amphoric breathing could be made out, but not always. Vocal resonance was increased. The larynx showed some slight interarytænoid thickening, but was otherwise normal. The liver and spleen were thought to be slightly enlarged, and the urine contained 0·1 per cent. of albumin and numerous hyaline casts. The fluid from her swollen knee-joints was examined and found to be sterile. The diagnosis of bronchiectasis was made, and this was admirably confirmed by a skiagram taken by Mr. E. S. Worrall, which showed cavitation of the entire right lower lobe. She was treated by the ordinary remedies for bronchiectasis, and in addition an autogenous vaccine was prepared from her sputum. She was discharged in August "in statu quo."

She was readmitted in January, 1911, her general condition being somewhat worse, but her physical signs as before. The case appearing suitable for an attempt at drainage of the lung by surgical means, and the operation being agreed to by the patient, Mr. Rock Carling successfully opened and drained the lung on March 8. The opening was made as low as possible, portions of the eighth and ninth ribs being removed; the lung was carefully stitched to the parietal pleura and chest wall and then opened with a cautery, and the bronchiectatic cavities entered. A tube and some gauze were used for drainage. After the operation she did well, and seemed to improve for twelve days, but suddenly, on March 20, she had a severe hæmoptysis and died rapidly within ten minutes. This hæmoptysis was the only attack she had had while under observation at Westminster Hospital.

Post mortem: Body emaciated and pale. Surgical wound in right scapular line 2 in. long, and portions of the eighth and ninth ribs missing here. This wound led into the lower lobe of the right lung, which was bound to the chest wall by old adhesions and recent surgical sutures. The right pleural cavity was dry. The right lower lobe contained four obliquely placed cavities, situated midway between the anterior and posterior surfaces of the lobe. These cavities communicated with one another, the lowest draining by the surgical wound and the highest opened into the main bronchus to the lower lobe. These four cavities were filled with clot and debris. In the right bronchus, 1 in. from the bifurcation and just above the highest of the four cavities just mentioned, was a pedunculated tumour about the size of a walnut. This tumour was attached by a short pedicle to the wall of the bronchus, and on cross-section was seen to be of firm consistency with patches of softening scattered about it. The colour of the tumour was white, the softened areas being somewhat more yellow than the rest. The left lung was voluminous and contained inhaled blood. The stomach contained blood.



The right lung bisected, showing a pedunculated tumour in the bronchus, together with four cavities and the surgical drainage hole.

The kidneys, spleen and liver showed amyloid degeneration, and in addition the liver showed numbers of small hard white secondary deposits, the size of a large pin's head to a pea. These were scattered throughout the liver substance, but more so at the periphery than in the deeper parts. Nothing else noteworthy about the viscera.

On histological examination of the tumour, it was seen to be covered partly by columnar epithelium and partly by squamous epithelium (metaplasia). In places the epithelium is much degenerated. The tumour itself is divided into loculi by fibrous bands, which in places are of considerable thickness; these loculi are filled by small round and cuboidal cells, the nuclei of which are round, and though small are relatively large when compared with the cell. In places the tumour is very vascular, and there are large areas of degeneration in several parts (? caused by hæmorrhage into the growth). In some situations the arrangement of the cells is adenomatous, and therefore might by some be classed as a carcinoma. The cells, however, are of mesoblastic type, and it would be more correct to class it as a mesothelioma (adeno-sarcoma), the histology closely resembling those appearances seen in tumours of supposed congenital origin. The secondary deposits have a similar structure, but no degeneration is visible.

The points of interest in the case are: (1) The rarity of the condition; (2) the impossibility of diagnosing the condition except with the bronchoscope; (3) the slow growth of the tumour and the long history; (4) the intermittent occurrence of amphoric breathing, doubtless due to movements of the tumour in the bronchus; (5) the mode of termination by (?) hæmorrhage from the growth. As regards the mode of termination and the difficulties of diagnosis, it is interesting to compare this case with two cases of pedunculated tumour of the stomach that Dr. Gossage and myself showed before this Section in November (1913).[1] In both these stomach cases the mode of termination was by hæmorrhage from the growth, which also showed extensive areas of degeneration, as in the case under discussion.

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[1] Gossage and Braxton Hicks, *Proceedings*, p. 33.

Medical Section.

May 26, 1914.

Dr. Samuel West, President of the Section, in the Chair.

On the Murmurs in Dilated Hearts and their Explanations.

By Samuel West, M.D.

Dilatation of the heart is a common condition, and is easily recognized by physical signs. Murmurs are frequently associated with dilatation, and are due to it, for they come and go with it. They may be, therefore, very properly described as "dilatation murmurs." How they are produced is a problem upon which opinions differ, and it is to some points connected with this problem that I propose to address myself.

I.—It may simplify the question if we consider first the conditions under which murmurs occur in dilated vessels, arteries and veins. Murmurs are "audible eddies." The most marked murmurs are often said to be due to a "jet," but the jet only causes violent eddies. It is very extraordinary that the blood circulates through the normal vessels and heart without producing murmurs. Eddies represent loss of power. The absence of murmurs shows the wonderful physiological adjustment of the vessels to the blood which passes through them, so that in spite of all the twists and turns the blood has to make, no eddies are produced. It is no wonder that alterations in the vessels should cause eddies and murmurs. The wonder is that they are not more common.

The conditions under which eddies form fall into two groups, according as the blood is passing: (*A*) into or out of a dilatation of the vessel, or (*B*) through a constriction in it. For the eddies to be audible they must be sufficiently forcible, so that they will depend upon the force of the circulation. This explains why these murmurs vary in intensity at different times, why they come and go, and sometimes even disappear.

(*A*) (*a*) Of the forms in which dilatation is the prominent change the simplest is that known as *mimic aneurysm* (fig. 1). The name was, I believe, invented by Paget, although the condition was certainly known to Laennec. I wrote on the subject many years ago, but though the condition is by no means uncommon it seems to have fallen out of recent literature, and to be hardly referred to now. The name "mimic aneurysm" is an excellent one. It describes exactly what it is—viz., a fusiform dilatation of a part of a large artery which, however, is not permanent but transient. The subclavian is the common artery to be affected. Then under the clavicle a distinct pulsating swelling is found, over which the veins may be distended and a systolic murmur heard. It is a transient condition. It comes and goes, lasting only, it may be, a few minutes, and with it goes the murmur too. I have seen the same condition also in the carotid at the root of the neck. In its most familiar form it is known as "the pulsating aorta," or what Laennec described as abdominal pulsation. In these cases not only is the pulsation marked but a swelling may be obvious, sufficient to suggest an actual aneurysm. Indeed, it is not rare in hospital practice to have such cases sent in with that diagnosis. The pulsation and the signs come and go.

In these cases of simple dilatation murmurs are not always present. This depends partly upon the abruptness of the dilatation, and partly upon the force of the circulation; but as an attack of abdominal pulsation is usually associated with palpitation, the action of the heart being rapid and forcible, the murmur is generally well marked so long as the attack lasts.

Cases of abdominal pulsation are certainly rarer in the wards than they used to be. I can hardly suppose that the condition is actually less common, but I presume that it is more generally recognized, and being regarded as a neurosis does not excite sufficient interest for the case to be admitted into the hospital.

(*b*) A true fusiform aneurysm presents exactly the same condition, except that the dilatation is permanent. Over it a systolic murmur is common.

(*c*) With *saccular aneurysms* murmurs are common, though not constant. In other words, every saccular aneurysm is not so placed that the circulation causes eddies in it sufficient to produce a murmur (fig. 2). The reason of this may be either (1) that the sac lies at the side of the vessel, and out of the direct current of blood, so that the blood passes over its mouth rather than into the sac, or (2) that the sac itself is not distensile enough to allow sufficient blood to enter for the eddies to form; this may be due to rigid walls or to the cavity being filled with clot, but even large thin-walled aneurysms may present no murmur, just as sometimes they may not even pulsate.

(*B*) The second group of conditions which may cause the eddies necessary for the murmur is that in which the vessel is constricted, the blood having then to pass through a constriction, and having thus a dilatation, relative or absolute, both above and below, conditions the most favourable of all for the eddies required (fig. 3).

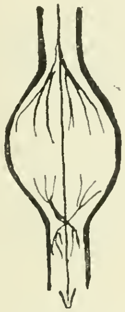


Fig. 1.

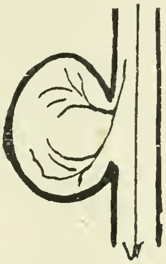


Fig. 2.

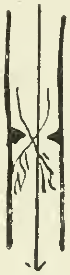


Fig. 3.

(*a*) This constriction may be produced by *external pressure*, by the stethoscope for instance, or by a tumour or bony prominence pressing on the vessel.

(*b*) An allied condition is that which occurs at the root of the neck, where the external jugular vein passes through the fibrous membrane, closing the thorax in the supraclavicular fossa. If this vein dilate the fibrous ring through which it passes being rigid, a relative constriction is produced, and a murmur ensues. This is the explanation usually given of the venous murmur audible above the clavicle in chlorosis. Indeed, it is in chlorosis especially that the condition requisite for the production of these murmurs can be best demonstrated. Thus the murmur can easily be produced or exaggerated by pressure, and made to vary with the force or rate of the circulation, being loudest in the erect position, and on inspiration and during diastole.

(*c*) Constriction of a vessel is, however, more commonly produced by *disease of its walls*. In this case the lumen is narrowed, and eddies are the necessary result.

II.—Similar conditions in the heart will be capable of producing murmurs. If it be difficult to explain the absence of murmurs in healthy vessels, it is still more difficult in the case of the heart, where the blood has to pass through so many orifices, and to turn so many corners.

Where there is organic disease, especially of the orifices, the occurrence of murmurs is easy to comprehend, but it is with the murmurs which occur where there is no gross structural lesion that I have to deal—i.e., those in which there is only one abnormal condition present, viz., dilatation. In the dilated heart the normal relation between the orifices and the cavities is changed so that the blood no longer passes in the usual uniform stream, but is driven here and there through the dilated cavities and so produces the requisite eddies.

Dilatation murmurs in the heart fall into two groups, according as they occur at the base of the heart or over the body of it, and may be described as (*A*) *basic* or (*B*) *ventricular* respectively. Whether basic or ventricular, they may be present on the right or left sides in the aortic and pulmonary areas in the one case, and over the right or left ventricles or auricles in the other.

Wherever they occur they are almost invariably systolic in time, and soft or blowing in character, while the heart sounds, though they may be somewhat modified, are almost, without exception, present and distinct.

(*A*) The *basic murmurs* are often called hæmic and referred to some altered condition of the blood, but what this altered condition is, except that there is anæmia in some form, is not explained. Moreover, these murmurs vary from time to time, while the blood condition remains unchanged. Anæmia of any kind causing, as it must, defective nutrition, and therefore weakness of the cardiac muscle, will lead to dilatation, and this dilatation is easy of demonstration. If "hæmic" is a bad term so is "functional," which merely means absence of gross structural lesion.

(*a*) Murmurs of this kind *at the left base* are usually called *pulmonary*, and are assumed to be produced in the pulmonary artery. If so, they may be due to the eddies produced by the blood as it passes through the normal orifices into a dilated artery above or more probably out of the dilated right ventricle below. It is also possible that they are sometimes due to a dilated left auricle pressing on the pulmonary artery from without.

(*b*) Of the basic murmurs *at the right base—i.e., in the aorta area.* I only wish to refer to one group, which is not as well recognized as it deserves to be. A perfectly healthy man, for example, may present himself for examination for life insurance. Everything may be normal, except that over the aortic area a very distinct blowing systolic murmur may be audible. A short rest may lead to its disappearance and it may not be present at all on another day. It seems to be due to the nervous excitement of the examination and to the fear that something may be found wrong. Men are often more nervous on examination for life insurance than when they consult the doctor for reasons of ill-health. At any rate, these murmurs are transient, and last, it may be, for a few minutes only. I have no doubt that many applicants for insurance have been rejected or rated up because the true condition has not been recognized, and the diagnosis has been made of organic disease of the aortic valves.

Though the recognition of this group of murmurs is therefore of great practical importance, their explanation is not simple. I believe these, too, are murmurs of dilatation, on account of their transient character; but whether the dilatation is in the aorta itself at its root, or in the left ventricle, I do not know; at any rate, I have not seen any evidence of dilatation of the ventricle, though the action of the heart is often hurried and palpitating as the result of the nervous excitement, so that I think it very likely that the condition is the same as that of the mimic aneurysms referred to and that the murmur is due to a transient dilatation of the root of the aortic arch.

(*B*) It is to the ventricle group of the dilatation murmurs that I wish more especially to address myself. These may also be on the right or left side respectively.

These murmurs are almost always systolic in time, soft and blowing in character, limited to the præcordial area, and rarely propagated as organic valvular murmurs are.

They are commonly stated to be due to regurgitation through the auriculo-ventricular orifices. This explanation I believe to be wrong, as I shall endeavour to show.

The muscle-bundles run round the heart in figure of eight fashion and lap round the auriculo-ventricular rings. The effect of this, according to Ludwig and Hasse's experiments, is that when the heart contracts the auriculo-ventricular rings are also constricted so that the orifices are narrowed. This would appear to be a special provision for doubly ensuring competency of the valves during health, and it might be that it would be sufficient to prevent incompetency, even when the valves were to some extent diseased.

Ludwig and Hasse, however, went further and drew the conclusion that even in health this contraction was essential, and that without it, even perfectly healthy valves were not competent to close the orifices; in other words, that muscular weakness even in slight degree would render the valves incompetent and thus allow regurgitation.

This is an astounding conclusion to arrive at. A priori, it is in the highest degree improbable, for all the important organs of the body have a large margin over what is the minimum required for health. Thus two-thirds of the liver, kidneys, and lungs can be destroyed before life becomes impossible, and small defects are almost unnoticeable. Can it be that the heart alone has so little to spare that muscular weakness, of only slight degree and of a temporary nature, can lead at once to such a serious defect as valvular incompetency?

Ludwig and Hasse's experiment consisted in plunging the freshly excised heart into a saturated solution of bichromate of potash. This caused extreme contraction of the heart muscle, and of the auriculo-ventricular orifices also. It was a violent experiment, but it showed that contraction of the heart muscle narrowed the auriculo-ventricular orifices; it could not however prove that without this contraction healthy valves would be incompetent.

Post-mortem observation is against such a conclusion, for in relaxed condition of the heart post-mortem the valves are generally competent at least to hold water, even when the orifices can be shown by measurement to be stretched a good deal beyond their normal size.

But the theory that these dilatation murmurs are due to regurgitation through the valvular orifices must stand the test of clinical observation before it can be accepted.

Of course this theory cannot apply to the basic group of dilatation murmurs at all, though it actually has been also extended to them. It can apply only to the ventricular group. The obvious test is to compare these dilatation murmurs with the regurgitant murmurs of organic disease. If they agree the theory is established. If they do not agree the theory must fall.

(1) The ventricular dilatation murmurs of the left side.

(*a*) The characters of the murmurs of mitral regurgitation resultant from organic disease are well known. These murmurs are systolic in time, audible at the apex and outside it, transmitted to the axilla and to the angle of the scapula where they may be heard louder than elsewhere. The heart sounds are greatly altered.

Sometimes it may be that these murmurs are not so definitely propagated. They may vary in many particulars, and may at times even be absent. These variations may depend upon varying conditions in the force of the circulation or heart's action, but the general rule is that the regurgitant murmurs are propagated as stated.

The left ventricle dilatation murmurs, however, differ. They are systolic in time as a rule, softer and more blowing in character; they are definitely limited to the præcordium, heard more widely over it, and are not propagated to the axilla and back, while the heart sounds are little, if at all, changed.

If there are, then, these differences the same explanation can hardly fit both, and it follows that the murmurs of dilatation cannot be due to regurgitation.

But there is another important fact to be borne in mind—viz., that it sometimes happens, though rarely, that when the dilatation of the heart is extreme the murmurs are propagated as they would and ought to be if they were regurgitant. If, then, in some rare cases we have evidence that the dilatation murmur is regurgitant, while in the majority of cases the evidence is to the contrary, there must be for this majority some other explanation found. If not regurgitant they can only be intraventricular, that is, produced by eddies set up in the dilated ventricle.

In actual organic disease of the valves of the left side dilatation often increases the difficulties of exact diagnosis. So much so that it is often impossible to be certain of the exact condition until the dilatation has more or less passed off, when the diagnosis, which at the time was difficult or impossible, becomes easy and simple.

(*b*) The apex murmurs associated with aortic regurgitation are instructive. The murmur of aortic regurgitation is characteristic enough even when transmitted to the apex, so long as the ventricle is hypertrophied only and not dilated; but so soon as dilatation occurs and becomes marked new apex murmurs of an entirely different kind develop, which often raise the question whether there is mitral incompetency as well as aortic regurgitation. There is then audible at the apex and over an area within it a general churning, which is more or less continuous throughout the whole heart cycle—i.e., during diastole as well as systolic (fig. 4). It is so peculiar and characteristic that on putting the ear to the apex the diagnosis of aortic regurgitation is at once suggested, and as a rule no part of this churning is transmitted as regurgitant mitral murmurs are.

These murmurs vary a good deal in different cases. One of them has been described as Flint's murmur, though known and recognized long before it became connected with Flint's name. Flint's murmur has been described as the murmur of mitral stenosis without mitral disease, but it is not in the least like the true presystolic murmur, nor is it really presystolic in time. It is nothing more than a special form of the general churning I have described, and, like it, is endoventricular and due to dilatation.

(*c*) As with aortic regurgitation the dilatation of the ventricle often raises the question of mitral disease, so with mitral regurgitation murmurs are sometimes heard at the base which raise the question of aortic regurgitation.

In a case of undoubted mitral regurgitation there may be heard in the left third intercostal space about an inch or so from the sternum a double or continuous murmur. Although many aortic regurgitant murmurs are heard best and sometimes only in the left third intercostal space near the sternum, this murmur is continuous and double and not diastolic only, so that careful auscultation will soon show that aortic regurgitation alone will not explain it (fig. 5). Occurring as it does farther from the sternum and over a larger area there is nothing left for it but the left auricle, and it must be, I consider, a dilatation murmur produced in the dilated left auricle or appendix.

(2) The ventricular dilatation murmurs *of the right side* are much more easy to deal with than those of the left side, for they are more superficial and the dilatation of the right side of the heart more easily demonstrated.

Tricuspid regurgitation due to organic disease though a very rare condition yields very characteristic physical signs. The systolic murmur is well marked and is propagated in a very definite direction from the lower part of the sternum transversely outwards to the right where the auricle can be shown clearly by percussion to be greatly dilated (fig. 6).

Tricuspid regurgitation is a very favourite diagnosis with some clinicians, but then on theoretical grounds and not on physical signs. The right side of the heart is greatly dilated as shown by percussion; there is epigastric pulsation; distension and pulsation in the jugular veins. These physical signs are considered sufficient for the diagnosis even without any murmur whatever, but they may all be present without regurgitation. Murmurs over a dilated right heart are by no means common, yet dilatation is an everyday phenomenon.

I do not know that I have ever seen the characteristic murmurs of tricuspid regurgitation without organic disease, and have in many cases confirmed the diagnosis by post-mortem examination. When murmurs over a dilated right heart do occur they are soft and blowing, heard over the ventricle specially and not over the auricle, and are not propagated as those of organic disease are across the sternum towards the right side. Therefore, I maintain that on the right side as on the left they are not due to regurgitation through the auriculo-ventricular orifices, but are produced within the dilated chamber.

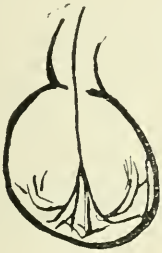


Fig. 4.

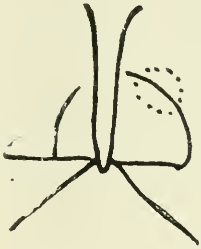


Fig. 5.

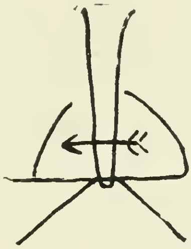


Fig. 6.

The considerations I have brought forward thus justify the conclusion I desire to establish—viz., that these ventricular dilatation murmurs are not regurgitant, but are due to eddies set up within the dilated cavities; in other words, that they are not valvular but intraventricular. They are, of course, connected with defective muscular action, but only so far as this leads to dilatation. Varying degrees of dilatation associated with variations in the force of muscular contraction are adequate to explain all the phenomena met with.

DISCUSSION.

Dr. ALEXANDER MORISON remarked that it was an agreeable experience at the present day to take part in a discussion which concerned the mechanics rather than the dynamics of cardiac action, and the paper read by Dr. West raised many interesting questions on an interesting clinical condition of which there were several types. He doubted, however, whether the intracavital vibrations in the blood, suggested by Dr. West in explanation of the bruit of cardiac dilatation, were an altogether acceptable explanation of the phenomena in question. The establishment of the bruit of mitral insufficiency might be a sudden and very striking phenomenon, and one which, in his opinion, could only be satisfactorily explained on the assumption of an actual regurgitation through the cusps. He related a case in which a heart presenting every evidence of normal action became, during the debility following a surgical operation, suddenly affected by so loud a systolic apical bruit as to suggest long-standing mitral regurgitation. The bruit was conducted outwards, and was audible in the back. This phenomenon disappeared. In another instance a heart equally free from the evidence of insufficient valvular closure suddenly developed a paroxysmal tachycardia, which as suddenly subsided, leaving the patient comfortable, but only to be followed by a "cadented" extrasystolia, and this by a loud apical bruit traceable outwards to the left and audible in the back, which persisted until death by syncope a day later. The difference between such cases and the soft bruits of mitral insufficiency referred to by Dr. West was, he believed, one of degree of dilatation. The cause of both he considered to be regurgitation through the mitral curtains. The aortic systolic bruits mentioned might possibly be due to a relative dilatation of the left ventricle, but he was sceptical of any dilatation of the aortic orifice, while he altogether doubted the occurrence of a *functional* aortic diastolic murmur. He agreed with Dr. West that it was only with organic disease of the tricuspid valve that a loud bruit of tricuspid regurgitation was associated. He had known this to be loud, conducted outwards to the right and audible in the back in an organic case. This difference between some functional bruits in this situation, as compared with those occurring at the mitral orifice, was probably due to the relatively thin wall of the right as compared with that of the left ventricle. There was reason to believe that there was a physiological regurgitation at times through the tricuspid valves, which might occur with a very soft bruit at the right apex or with no such audible accompaniment. While it was well known that in young subjects apical bruits suggestive of mitral and tricuspid regurgitation might occur and have no serious significance, he was inclined to think that the importance of these phenomena in such cases might be unduly minimized as well as exaggerated. In young adolescents they were not rare, but they were also not, in his opinion, negligible. The youth manifesting them should not be allowed to exercise himself in such a manner as he might do in the absence of such evidence of defective cardiac tone as these signs indicated. Such bruits usually disappeared with the restoration of a normal degree of cardiac force. Their disappearance on the assumption of the erect posture, as was frequently observed, was probably due to the evoking of greater cardiac force and rate by that position as compared with recumbency.

Dr. BEZLY THORNE said that he had always regarded the explanation put forward by the late Dr. Foxwell as offering a satisfactory explanation of a considerable proportion of right-side murmurs, especially of those which were influenced by posture. Some such, however loud they might be in the recumbent posture, not infrequently became inaudible when the erect posture was assumed. In the course of a discussion which had taken place in the Section for the Study of Disease in Children rather more than a year ago, he had ventured to refer to them as "postural murmurs," and had pointed out that they were a concomitant of a condition of general cardiovascular atony. In some cases they were associated with an exaggeration of the heart sounds suggestive of hypertrophy; but firm pressure on the thoracic wall with the chest-piece of the stethoscope, especially on a rib, arresting or limiting vibration, reduced them to normal, or something less than normal, intensity, showing that the increase of sound-volume had been due to a megaphonic action of the chest wall against which the dilated right ventricle beat with unduly direct apposition. A similar phenomenon might be observed in dilatation of the aorta. It was important, he added, to bear in mind that such murmurs were indications of weakness of the heart muscle, and that they must not be regarded with indifference as though they were consistent with a state of health; and that, on the other hand, the causative condition was amenable to treatment. Looking back over a series of years, he could not recall an instance in which the subject of such a condition, threatened with exclusion from one of the public services, had not been relieved of the cardiac condition and the consequent murmurs by one means or another, and successfully passed the scrutiny of the examining medical board.

Dr. F. PARKES WEBER remarked that the curious noise in one ear, known as *objective pulsating tinnitus*, could be explained as arising from physical conditions similar to those which produced the "pressure murmurs" in the great arteries and veins at the root of the neck, which had been alluded to by Dr. West. Dr. Weber specially referred to the rare, but very troublesome, chronic pulsating tinnitus, which could now and then be heard by—that is to say, becoming objective to—the examining medical man, especially when the latter united his own external auditory meatus with the patient's external auditory meatus by means of an otoscope. The cause of such a murmur was almost certainly a *relative* constriction in the channel of the artery passing through the skull. The murmur varied with alterations in the local blood-pressure and could be made to stop altogether by pressure on the carotid artery at the root of the neck. Such a chronic, though often intermittent, pulsating tinnitus (termed "pulsating" to distinguish it from other forms of tinnitus) was generally a source of great distress and annoyance to the patient, and the patient's medical attendant not rarely came to the conclusion that it was probably due to an intracranial aneurysm. Sooner or later, however, it usually spontaneously disappeared, and in scarcely any cases had it really been due to an aneurysm.

Dr. Weber would not, on the present occasion, enter on the subject of *insurance cardiac murmurs.* He grouped those murmurs all into a class as "insurance murmurs," because they had a special interest in regard to examinations for life insurance and other medical examinations. Dr. West had likewise discussed the diastolic murmur sometimes heard at the base of the heart in cases of mitral stenosis. He (Dr. Weber) thought that the most typical murmur of that kind was one heard just to the left of the sternum, and occurring at the commencement of the diastole, corresponding in time to the typical murmur of slight aortic reflux. Many authors had attributed it to slight reflux through the pulmonary orifice associated with the mitral stenosis; and their explanation might, after all, be the correct one, though all the explanations which had been yet offered were doubtful. Dr. West had furthermore referred to the so-called *murmurs of Austin Flint*—namely, presystolic murmurs, which had sometimes been mistaken for murmurs of mitral stenosis, though in reality occurring in the absence of any mitral stenosis, and in some way causally connected with the presence of aortic reflux. Dr. West said (as he understood him) that such murmurs were quite different from those actually due to mitral stenosis, but he (Dr. Weber) thought they might exactly simulate the presystolic murmur of mitral stenosis—so much so that, from one or two examinations in certain cases where a "Flint's murmur" was present, it was almost impossible to exclude the presence of mitral stenosis in addition to aortic reflux. In fact, the ordinary definition of a "Flint's murmur" was, he believed, the correct one—namely, an apical murmur simulating one of mitral stenosis, but occurring in the absence of mitral stenosis and associated with, and in some way due to, the presence of aortic reflux.

Pathological Changes in Case of Leukæmia from Prolonged Use of X-rays.

By J. MICHELL CLARKE, M.D.

THE patient was under observation from July 18, 1908, until her death in July, 1913, continuously for the first two years, afterwards at intervals for long periods. For about four years she was constantly under treatment by X-rays, and during the first two and a half years with remarkable success, the condition of the blood returning nearly to the normal. In the early stages the X-rays were applied over the greatly enlarged spleen as was the practice at this date, and the dose not exactly estimated. Later she was irradiated over all the long bones, and over the sternum and spine, and the dose at each sitting was one pastille, the skin being protected by one or two layers of aluminium and the clothes. The skin of the left side of the abdomen became deeply pigmented; beyond this there were no other cutaneous lesions from the X-rays. An abstract of the case until July, 1910, was published in the *Bristol Medico-Chirurgical Journal* of September, 1910. The following is a short account of the clinical history:—

S. B., aged 42, had always enjoyed good health until two years before. She sought admission to the Bristol General Hospital in July, 1908, for dyspepsia, vomiting, and aching pains in the abdomen. Catamenia ceased suddenly two years ago. Aspect: Healthy, well nourished; pulse 84; respirations 20; temperature 99° F.; appetite bad; bowels regular; tongue moist and clean. The urine, specific gravity 1022, 40 oz. daily, urea 1 per cent. It contained no albumin or sugar, and deposited no uric acid crystals. Except for a soft systolic murmur at the apex, the heart and lungs were normal. Abdomen large; liver, edge smooth, about 1 in. below costal margin; spleen occupied nearly the whole of the left side of the abdomen, extending to within 2 in. of the umbilicus, and just above the iliac crest. It was smooth, firm, not tender. Splenic dullness began above at seventh rib. No ascites.

On September 8 treatment by X-rays was begun. In a week's time there was improvement in strength and general well-being. For duration of X-ray treatment and effect on blood condition *see* chart (Table 1). During the first three weeks there was a marked increase in uric acid passed in the urine. She was treated by X-rays until the end of December. With the improvement in the blood the spleen diminished in size, so that finally its tip only was felt about 2 to 3 in. below the ribs.

From January to April, 1910, she took a course of arsenic. From November, 1908, to September, 1909, she remained in good health, and was able to earn her living. In September, 1909, her health again began to deteriorate, with the reappearance of leukæmic changes in the blood. A second course of X-rays was given from November 4, 1909, to March 10, 1910, but, as will be seen from the chart, without influence on the blood state, which became worse, but never so bad as on first admission. As she was weak and ill, she was readmitted to hospital in February, 1910. X-rays stopped on March 10. The spleen began to enlarge again at the end of February, and was then about 4 to 5 in. below the ribs, about a third of its size on first admission.

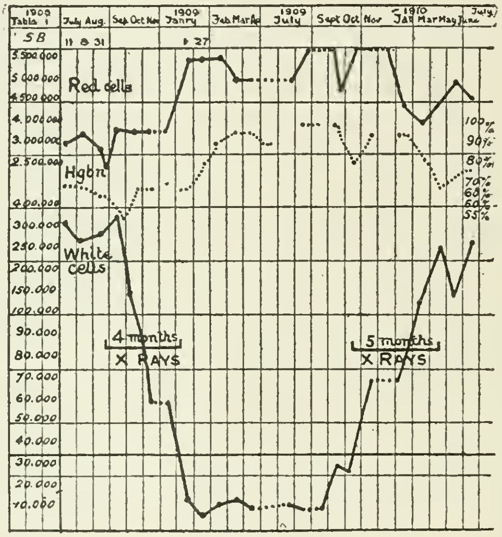


TABLE I.

Chart showing duration of X-ray treatment and effect on blood condition.

In October, 1910, her condition had deteriorated, the spleen had much increased in size, the number of white cells was over 200,000 per cubic millimetre, erythrocytes and amount of hæmoglobin decreased. The large number of eosinophile leucocytes about this period is somewhat curious. Another prolonged course of X-rays again produced a remarkable improvement, the white cells fell to normal, with coincident

Table II.—Differential Count of White Cells.

Date	Polymorpho-nuclears	Small lympho-cytes	Large lympho-cytes	Transi-tionals	Eosino-philes	Baso-philes	Myelocytes					Nucleated red cells to 500 whites	Myelo-cytes	Total whites		
							Finely granular	Degene-rated	Eosino-phile	Baso-phile	Pro-myelo-cytes					
1908	%			%	%	%	%	%	%	%	%		%			
July 19	33·0	4·0	2·2	2·2	2·2	2·2	34·9	—	4·0	0·7	6·0	4·8	39·6	321,700	Atoxyl	
,, 26	40·2	3·4	1·6	0·3	2·2	1·8	36·0	—	6·8	2·3	5·0	0·9	45·0	270,000		
Aug. 31	26·6	2·8	2·6	4·0	3·8	1·2	47·8	—	5·6	4·4	2·0	2·2	57·8	285,000		
Sept. 4	33·0	2·4	1·8	1·0	1·0	0·5	38·6	—	5·7	1·7	11·0	11·0	45·9	333,000	X-rays	
,, 28	31·0	2·6	0·4	4·2	2·4	2·0	47·0	—	6·0	2·0	3·0	3·0	55·0	—		Oct. 21 to Nov. 4; X-rays stopped; tip of spleen only to be felt in descent
Oct.	40·8	3·6	2·4	10·0	3·0	0·2	31·6	—	2·2	2·8	1·0	2·0	38·6	127,000	X-rays forty-eight times	
Nov.	45·3	4·8	1·0	6·2	2·4	2·2	27·7	—	13·0	1·0	4·8	1·5	30·0	60,000		
Dec.	47·8	15·3	7·4	3·4	3·0	3·0	13·0	—	2·6	1·4	4·0	1·0	17·0	—		
1909																
Jan.	60·0	16·0	4·5	2·0	7·5	5·0	1·5	—	2·0	0·5	1·5	0·2	4·0	17,000 7,200	Spleen remained small	
Feb.	65·0	18·6	8·6	0·4	3·8	2·2	0·8	—	—	—	2·0	—	0·8	12,000		
Mar.	60·0	18·0	7·5	0·2	5·8	3·0	0·9	—	—	—	2·5	0·3	0·9	12,400		
June	64·6	19·0	5·0	2·5	2·6	2·7	1·0	—	—	0·2	2·0	—	1·2	12,400		
July	56·5	18·7	2·6	4·0	2·6	2·0	5·4	—	1·4	1·3	5·2	—	7·9	12,000		Spleen remained small
Sept.	50·2	15·4	1·2	3·5	5·5	5·0	10·7	—	0·2	0·7	5·2	—	11·6	31,800		
Oct.	52·5	7·5	4·4	3·8	2·2	1·5	15·4	—	0·7	0·1	10·0	—	16·2	28,800		
Dec.	33·5	12·5	4·2	2·7	0·75	5·0	16·5	12·2	1·7	1·7	7·5	—	32·0	69,600	X-rays forty times	
1910												(Normoblasts)				
Jan.	36·0	6·3	1·0	3·6	1·0	2·3	16·0	27·3	1·0	1·0	4·3	0·3	45·0	73,000		
Feb.	40·0	3·1	0·6	4·0	1·5	3·4	10·3	18·7	4·7	2·2	11·5	0·3	35·9	—		Spleen very slightly increased
Mar. 1	35·5	5·0	3·6	3·0	1·6	4·0	11·3	18·2	2·8	2·5	11·4	0·3	34·9	129,600		
May 1	38·5	3·0	2·4	5·0	1·4	2·4	32·4		3·6	1·6	7·6	3·8	—	232,000		
June 1	34·6	3·0	0·44	4·6	1·3	3·7	16·4	27·0	2·2	2·0	4·6	4·6	47·6	146,000		

increase in red cells and hæmoglobin. Unlike, however, the first period of amelioration when the myelocytes almost disappeared for a time, these cells in differential counts formed 15 to 20 per cent. of the total, indicating that the disease was taking a less favourable course.

At the end of 1911 her condition was worse; the spleen was smaller and had become very hard, and the liver was now first noticeably enlarged. She had bronchitis with scattered patches of bronchopneumonia, showing as shaded areas under fluorescent screen, and in right lung at level of fifth dorsal spine there was a shadow of apparently a gland. The sputum showed no cells other than those commonly found in bronchitis, and although the lung condition at the time strongly suggested patches of leukæmic infiltration, it afterwards entirely cleared up.

Treatment by X-rays was resumed from December, 1911, to August, 1912, and she improved to some extent, but never regained much strength. At the end of this time the spleen was small, about 2 in. below the ribs, and of stony hardness; the liver reached to the umbilicus. There was no ascites.

After September, 1912, she ceased to attend the hospital, and remained at home. She was thus lost sight of until June, 1913, when she was brought up to the hospital in a state of profound prostration, anæmia and emaciation, and suffering from an almost constant oozing of blood from the swollen gums. This hæmorrhage was extremely difficult to stop. There was fever for the first time during the course of the illness, it was of hectic type, the temperature reading 100° or 101° F. in the evening. The abdomen was distended and protuberant, this being due to the enormous size of the liver, which filled the whole abdomen except the left iliac and lumbar regions. It was hard and its surface smooth. The spleen was very little enlarged, but of stony hardness. There was a considerable amount of ascites. She gradually sank, and died on July 23. The accompanying table shows the condition of the blood at intervals from October, 1910, to the time of her death, and the periods during which X-rays were used.

At the post-mortem examination the chief points were: Presence of fluid in all serous cavities, enlargement of mediastinal, post-peritoneal, and mesenteric glands (the latter appeared like caseous tuberculous glands, the two former grey, firm, and pigmented); lungs red and œdematous, with scattered white irregular miliary nodules, in connexion with bronchioles; the enormous size of the liver, which was hard, nodular in parts, and on section its surface was glistening, and mottled, pale pink and yellow; kidneys normal in size and of hard consistence,

TABLE III.—BLOOD COUNTS FROM OCTOBER, 1910, TO JULY, 1913.

	Treatment	Red cells	Hæmo-globin	Total white cells per c.mm.	Myelo-cytes	Poly-morpho-nuclears	LYMPHOCYTES		Eosino-philes	Mast cells	MYELOCYTES				Megalo-blasts	
							Small	Large			Neutro- or acido-phile	Pro-myelo-cytes	Baso-phile	Eosino-phile		
1910					%	%	%	%	%	%	%	%	%	%	%	
Oct. 1	X-rays twenty-eight times	3,190,000	63	210,000	34·0	46·4	5·0	2·0	9·0	—	20·8	13·2		1·0	2	Spleen very large
Jan. 1		3,600,000	78	19,000	28·0	47·0	15·0	9·0	7·0	—	13·0	9·0	6·0	2·0	—	—
1911 Feb.	Liq. arsenicalis, 3 to 7 minims	5,000,000	80	8,600	15·0	64·6	10·0	2·0	1·1	2·6	6·4	6·6	1·5	0·5	—	Spleen much smaller
Mar.	March 1: X-rays once or twice a week until July	5,000,000	—	8,000	20·0	58·0	13·0	10·0	—	4·0	8 0	6·0	6·0	—	—	—
May		4,600,000	80	24,800	37·0	48·0	10·0	3·0	2·0	—	23·0	8·0	6·0	—	—	—
Sept.	—	3,900,000	76	126,000	43·8	46·2	7·1	0·8	0·4	0·4	31·0	5·3	3·5	4·0	2	Spleen smaller; very hard
Oct.	—	4,000,000	72	740,000	54·0	25·0	8·0	2·0	6·0	1·0	36·0	7·0	6·0	5·0	3	—
Dec.	Dec. 21: X-rays once a week until August	3,900,000	70	760,000	56·0	30·2	4·0	2·0	1·2	6·0	32·0	13·0	6·0	5·0	5	Liver enlarged
1912 July		4,500,000	64	194,000	—	—	—	—	—	—	—	—	—	—	—	Spleen small
Sept.	—	2,760,000	70	380,000	—	—	—	—	—	—	—	—	—	—	—	Liver to umbilicus
1913 June 4	—	1,850,000	42	2,000,000*	60	34·0	0·6	1·2	1·6	2·6	41·4	11·2	4·2	3·8	4	Spleen small; liver nearly fills abdomen
July 20	—	2,000,000	49	2,000,000*	58	33·0	3 6	1 5	3·0	—	46·5	8·6	1·0	2·6	3 (normoblasts, 21)	

* Estimated by hæmatocrit; could not be counted because of agglutination.

with a few white nodules beneath the capsule, and white lines of infiltration along the medullary rays; spleen somewhat smaller than normal size, very hard and tough, on the surface many white fibrous plaques with puckerings and notches; on section like hard wax, glistening and absolutely dry, and in colour pale brown or deep red; capsule and trabeculæ greatly thickened; in the intestines the lymph follicles were not apparent, and the mucous membrane was pale; the peritoneum was thickened and studded over with miliary nodules very suggestive of tubercles. No lardaceous disease was found in any part of the organs by the ordinary tests, and no evidence of tuberculosis.

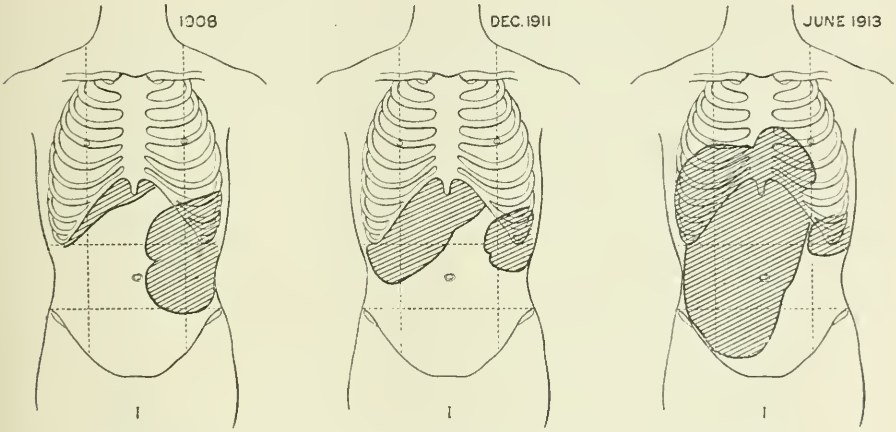
Microscopical Examination of Organs.—Sections were stained with eosin and methylene blue, eosin and hæmatoxylin, and with Leishman's stain after treatment with acetone. It was difficult to get the best intensity with Leishman's stain, but when this was attained it gave the best differentiation of the cells.

Liver: The veins contained red cells and abundant myelocytes; no red cells were seen in the capillaries. The organ was infiltrated with cells in masses in the portal spaces and filling the capillaries. The pathological process was one of simple atrophy of liver cells from pressure of distended intralobular capillaries crammed with myelocytes; in some small capillaries their lumen was entirely filled with myelocyte cells of large lymphocyte type, and some plasma cells; between the capillaries there was a delicate intralobular retiform tissue which stained badly, and had a finely granular appearance as if degenerating. The liver cells were only occasionally proliferating. The change was a diffuse one, and not nodular. There was no increase of connective tissue in portal canals between the lobules. Some proliferation of minute bile-ducts. There was nowhere any evidence of formation of red blood cells in the liver, nor of their destruction.

Spleen: There was great increase of fibrous tissue in trabeculæ and in Malphigian bodies, which were converted into dense masses of fibroid tissue from which strands radiated diffusely through the pulp. Vessels showed obliterative endarteritis, the larger veins were patent, and contained myelocytes; many of the smaller were thrombosed. The fibrous tissue had undergone a kind of hyaline degeneration. The cells in pulp were very scanty, and consisted chiefly of (1) myelocytes, some very large, many basophilic, many breaking up; (2) cells of considerable size, many with actively dividing nuclei, derived from endothelium of sinuses; (3) nucleated red cells; (4) a few giant cells with two to three nuclei; (5) very few red corpuscles, except in veins; (6) very few lymphocytes. No evidence of destruction of red cells, and no pigment accumulation.

Cervical glands: The chief change was the great increase in fibrous tissue and thickening of retiform tissue with obliteration of proper glandular structure. The cells consisted of a very large number of proliferated endothelial cells of sinuses, numerous myelocytes, a few nucleated red cells, and in places collections of small lymphocytes; very few large lymphocytes.

Hæmolymph glands: These show similar increase of fibroid tissue, which had apparently undergone some degenerative change (? hyaline degeneration), with large areas of retiform lymphoid tissue, the fibres being somewhat granular in appearance. The most striking changes were the number of cells of large lymphocyte type, a few showing basophile granules, and the absence of red blood cells. Other cells present were a small number of myelocytes many of them degenerating, cells probably derived from proliferating epithelium, and a few nucleated red cells.



Relative enlargement of liver and spleen at three periods of the illness.

Marrow (fig. 1): It was only by comparing sections stained in different ways that a complete picture of the changes in the marrow could be obtained. In the first place, there was no fibrosis of the marrow, except that there was possibly some increase of connective tissue around the large veins. The capillaries were well filled with red cells. Cells present were (1) chiefly myelocytes, with which the marrow appeared to be filled. Owing to the large number of them the fat cells of the marrow had disappeared, and the reticular tissue was obscured. The neutrophile myelocytes were most abundant, then in some sections eosinophile myelocytes, next non-granular cells or myeloblasts, with a fair number of basophile cells. Few degenerating myelocytes were seen. (2) Polymorphonuclears in fair abundance, with some eosinophile cells. (3) A small number of megakaryocytes. (4) A very few osteoclastic cells with red cells in their cytoplasm. (5) Erythrocytes and normoblasts fairly abundant. (6) Megaloblasts few in number. Lymphocytes were not numerous, in some sections almost absent, but from other preparations this was shown to be due to the small lymphocytes being generally aggregated into patches. Large lymphocytes were few. In places there were masses of free blood pigment, probably due to pre-lethal hæmorrhage.

Summarizing the above changes, we find an increase of fibrous tissue, showing in places hyaline degeneration, in spleen and lymph glands, with destruction of the proper lymphoid tissue, a caseated appearance of some glands, proliferation of endothelium of sinuses, and presence of myeloid elements. In hæmolymph glands, the presence of large numbers of cells of large lymphocyte type ((?) myeloblasts). In liver, an enormous accumulation in the portal spaces and within the lobules between the liver cells of myeloid cells and tissue; neither in this organ nor in the marrow any increase of fibroid tissue, and the marrow packed with myelocytes. Comparing the above changes with those described by Warthin[1] in cases under long-continued X-ray treatment, they closely correspond. The chief difference is that he found the chief cell of the marrow to be the large pale lymphocyte and myeloblast, but this was certainly not so in my case, nor did I find them present in the altered lymph glands. This could be well determined in the sections stained by Leishman's stain. On the other hand, they were present in large numbers in the hæmolymph glands as in his cases. The difference may be due to the fact that my patient had had no X-ray treatment for about nine months before death.

The changes above described support the conclusion Dr. Warthin draws, that the X-rays do not change the conditions in the hæmopoietic organs of the leukæmic to normal; the essential leukæmic process continues unchecked although somewhat altered in character. Thus in this case although the disease presented a greater degree of amelioration than I have ever seen in any other severe case, and the patient's life was undoubtedly prolonged, yet it nevertheless went on to a fatal termination. Clinically, one of the most interesting points was the enormous size of the liver in the later stages. In myeloid leukæmia the liver as a rule is only slightly enlarged, and it is exceptional for it to reach any great size.

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[1] "Minute Changes produced in Leukæmic Tissue by Exposure to Röntgen Rays," *Amer. Journ. Med. Sci.*, 1914, cxlvii, p. 72.

Dr. Rolleston [1] has lately reported a case of acute leukæmia in a boy, aged 5, in which the liver was very big, had the translucent appearance mentioned above, and the spleen was small. Microscopically, the liver was diffusely infiltrated with cells similar to those predominating in the marrow, which filled the capillaries and formed large clusters in the portal spaces; the condition was therefore similar to that in my case.

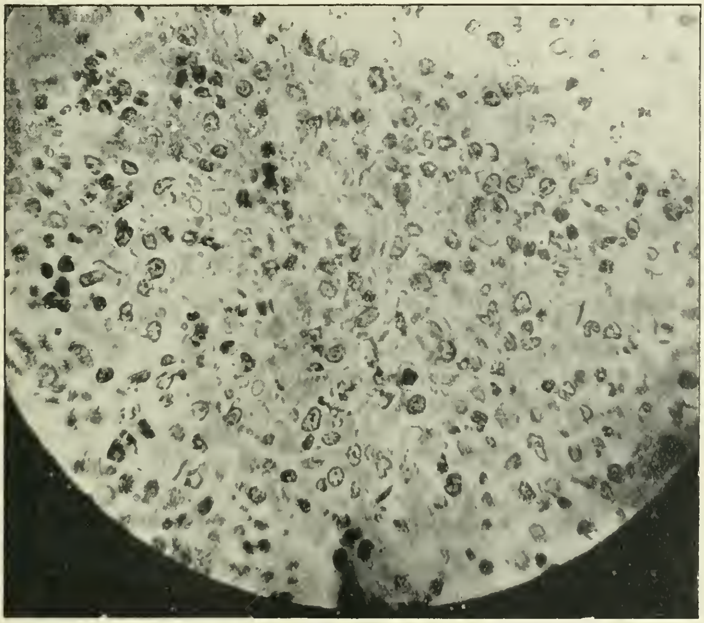

FIG. 1.

Case I. Photomicrograph of marrow showing absence of fat cells and spaces, and great numbers of myelocytes, mostly finely granular, with a few large lymphocytes, red cells, normoblasts and megaloblasts.

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[1] *Lancet*, 1914, i, p. 173.

He mentions that in one of Forbes and Langmead's cases of acute leukæmia in a boy, aged 9, there was enlargement of the liver without splenomegaly. In my case the enlargement of the liver took place gradually and in proportion to the progressive and finally extreme contraction of the spleen. As the spleen became fibrosed so the liver enlarged. In the final stage of the illness the liver enlargement was doubtless partly due to congestion from the failing heart. In the earlier stages there was no evidence of cardiac congestion, for although there was a soft systolic apex murmur, this had produced no disturbance in the circulatory system. It is tempting to suppose that as the spleen contracted and was put out of action the liver took its place as a repository to intercept and retain the cells poured into the blood from the excessive activity of the marrow. It has been mentioned above that sections of the liver showed no evidence of destruction of erythrocytes. Another interesting point brought out by the action of the X-rays in this case is that although operative removal of the spleen in leukæmia is speedily fatal, yet it can be gradually rendered functionless without any such result. The beneficial result of X-rays in leukæmia seems to be chiefly, if not entirely, due to the speedy destruction by them of the abnormal cells in the marrow, spleen and glands. The essential leukæmic process continues unchecked, after a time the X-rays seem to lose their power, or to be unable to cope with the advancing disease, and the fatal termination, though delayed, takes place. Warthin thinks that X-rays in addition to the above action may also inhibit the leukæmic process in the marrow; and this may be held to be supported by the better results obtained in leukæmia, since it has been the practice to X-ray the bones as well as the spleen and glands. Stengel and Pancoast,[1] in an experience of a large number of cases, lay stress upon the importance of this procedure if the best results are to be obtained. In my limited experience of about eight cases of leukæmia of the chronic form so treated, those cases did best, however, in which there was a great or considerable splenic enlargement—where this is not present the results were not so good. As X-ray treatment does not cure the essential leukæmic state, any inhibitory action upon the marrow seems at least uncertain, and the better results obtained by raying the bones may perhaps be attributed to destruction of the enormous number of myelocytes formed and remaining in the marrow. The action of X-rays in this and similar cases helps to elucidate the nature of leukæmia, for it seems to support the view now generally accepted that myeloid leukæmia is essentially and primarily a disease of the marrow, and that the splenomegaly and changes in glands and other organs are secondary and subsidiary. It was not unnatural that in the early study of the disease the great size of the spleen in myeloid leukæmia—next to the blood changes the most striking clinical feature in most cases—should have led to the view that this was the organ primarily at fault, especially as at that time study of the marrow was very imperfect. The use of X-rays, however, has shown that the enlargement of the spleen may be greatly reduced or abolished, and the abnormal cells in the blood-stream greatly diminished or even brought to vanishing point, and yet there is no cure of the disease but only a remission for a longer or shorter period, together with certain changes in the pathological process in the hæmopoietic organs. The splenic enlargement would seem to be secondary, and due to a protective action of the organ by taking up and fixing enormous numbers of myelocytes and so preventing them from passing on to more vital organs and interfering with their activity, and this case seems to show that the liver, when the spleen fails to do so, may for a time take on a similar function.

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[1] *Journ. Amer. Med. Assoc.*, Chicago, 1912, ii, p. 1166.

In any acute condition of leukæmia the use of the X-rays is well known to be prejudicial, and in every case requires great caution at first, as there may be little indication that the case is not a suitable one for treatment. In the following case there was nothing to show that the condition was otherwise than a chronic myeloid leukæmia with a moderate degree of anæmia and the anæmia was not definitely of the megaloblastic type, although at the end the blood state approximated to that condition sometimes called leukanæmia.

The patient was a labourer, aged 46. There was no history of syphilis. Duration of illness four to five months. The chief symptoms, of gradual onset, were debility, shortness of breath, and pains with a feeling of weight in abdomen. The pulse was weak, rate 100; blood-pressure low, 100 mm. Hg. The heart and lungs were normal; the liver not enlarged. The spleen was of large size, reaching to the umbilicus; splenic dullness began above at the seventh rib. The urine was normal. The temperature was normal throughout. After a week's rest in hospital and administration of iron he felt much better. On June 12, 1913, X-ray treatment was begun, and carried out cautiously. The bones were rayed twice weekly, but not twice in the same fourteen days over the same part; the spleen was only rayed once, as it was intended to treat this later on. The dose was one pastille at each sitting. As the patient felt very exhausted after the X-rays, and lost 2½ lb. in weight, X-ray treatment was stopped on June 23. He did not, however, improve, but showed a steady loss of strength and increase in anæmia. The spleen increased in size, and now came 2 in. below the umbilicus; it was very hard; the liver had also enlarged, reaching 3 in. below the ribs. The urine remained normal. From July 3 to July 20 he took benzol, 10 minims three times daily after meals. On July 21 he complained of his sight, and numerous hæmorrhages were found around the optic disk in both retinæ. During the next few days the anæmia became very profound. On July 25 he had a large hæmorrhage from the stomach, and died on July 26. The table gives the blood counts, which show a steadily progressive anæmia.

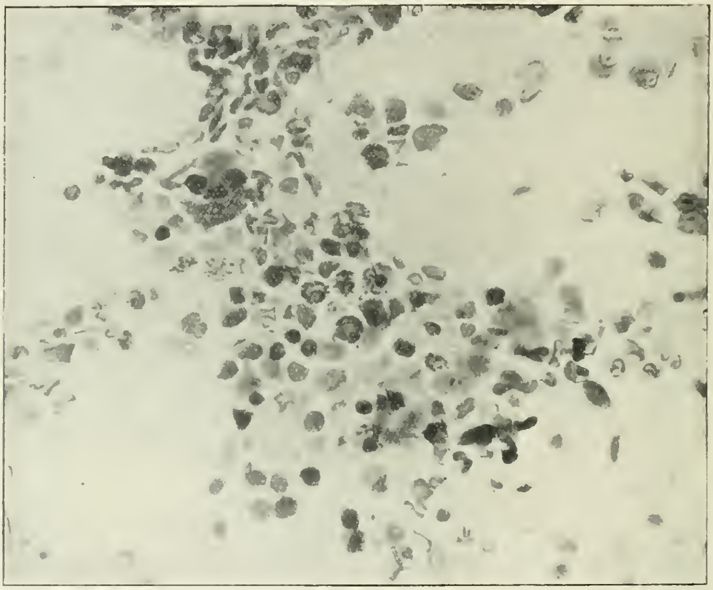

Fig. 2.

Case II. Photomicrograph of marrow showing normal reticular spaces of marrow, veins and capillaries containing myelocytes and red cells. Large numbers of myelocytes in the pulp of the marrow, many being coarsely granular eosinophile myelocytes. Lymphocytes were numerous. Near lower part of section is a hæmatopoietic focus.

Leave to make a post-mortem examination was refused, but a specimen of the marrow was taken from the femur. The reticulum of the marrow is well seen (fig. 2) and appeared normal, the capillaries and veins were normal and filled with red cells with a few myelocytes. There was an excess of cells in the marrow pulp, made up chiefly of (1) large numbers of myelocytes, containing fine granules staining brilliantly with eosin, and a few coarsely granular eosinophile myelocytes; (2) large numbers of megaloblasts, many in active division; (3) large numbers of myeloblasts or non-granular myelocytes. There were also abundant lymphocytes, both small and large, especially in certain areas, numerous normoblasts, a fair number of basophile myelocytes, very few polymorphonuclears, and very few giant cells. In addition to the myelocytic features the marrow, therefore, showed a megaloblastic change which was not represented in the blood; the index of the latter was never above 1, and the number of megaloblasts never exceeded 3 per cent.

TABLE IV.—BLOOD COUNTS IN CASE II.

	Treatment	Red cells	Hæmoglobin	Total white cells per c.mm.	Myelocytes	Polymorphonuclears	LYMPHOCYTES		Eosinophiles	Mast cells	MYELOCYTES				Normoblasts	Megaloblasts
							Small	Large			Neutro- or acidophile	Pro-myelocytes	Basophile	Eosinophile		
1913					%	%	%	%	%	%		%	%	%	%	%
June 6	X-rays, June 12 to 23	—	—	—	57·3	22·8	6·1	2·3	7·0	0·9	36·0	11·2	1·8	8·3	0·1	2·0
,, 14	—	3,400,000	64	65,600	63·7	26·0	3·5	2·5	3·6	0·5	37·5	17·0	0·7	8·5	—	3·0
,, 28	—	2,340,000	47	68,800	58·0	26·6	5·0	4·6	4·2	0·2	36·2	16·8	1·2	3·8	0·2	2·0
July 14	Benzol, 10 minims t.i.d., July 3 to 20	2,100,000	38	99,200	59·4	27·9	6·3	3·0	1·4	1·4	41 6	15·2	1·0	1·6	0·9	2·5
,, 21	—	1,850,000	33	118,000	65·0	25·4	6·6	3·0	1·6	0·3	42·5	18·0	1·0	3·5	2·0	2·0

The man had struggled on at his work as long as he was able—too long for his state of health—and had probably entered on the last downward stage of his illness when admitted, so that though the X-rays had possibly some prejudicial effect they cannot be held accountable for the result.

To Mr. Scott Williamson, Pathologist to Bristol General Hospital, who prepared excellent sections and lantern slides, my most cordial acknowledgments for his trouble are rendered.

DISCUSSION.

Dr. F. PARKES WEBER congratulated Professor Clarke on his clear and exact description of the case. He believed, however (contrary to Professor Clarke), that the patient's greatly enlarged liver had been the site of active blood formation, that is to say, chiefly myelocyte formation. Professor Clarke had described and pictured the hepatic capillaries as being crammed with myelocytes, &c. That signified nothing more nor less than what one might call *intra-capillary* leukæmic permeation of the liver, so frequently found in cases of myelocytic leukæmia. *Extra-vascular* leukæmic permeation (of interacinous distribution), though it occurred in myeloid leukæmias, was more pronounced usually in the lymphoid leukæmias. It was almost impossible to avoid the conclusion that leukæmic blood was being actively formed within the distended hepatic capillaries in cases of myeloid leukæmia similar to the one so ably described before the meeting by Professor Clarke. He (Dr. Weber) believed that the great size of the liver in Professor Clarke's case was mainly due to the new blood formation (chiefly myelocyte formation) going on there.

In Professor Clarke's case the sudden influx of nucleated red cells into the circulating blood was, he thought, doubtless to be explained as a vital reaction towards the anæmia (oligocythæmia rubra) which occurred at the terminal stage of the disease. A proper study of the varieties of anæmia associated with leukæmia still remained to be made. In some chronic leukæmic cases there was no oligocythæmia rubra at all, in fact, the erythrocyte count might be slightly above the normal. On the other hand, anæmia might occur early in the course of leukæmia. Anæmia associated with leukæmia might be of various types—namely, orthoplastic, megaloblastic (i.e., "metaplastic," as in so-called "pernicious anæmia"), or hypoplastic (i.e., approaching the type met with in cases of so-called "aplastic anæmia"). It was in the rare cases of leukæmia with a paradoxical absence of great excess of white cells in the blood, but accompanied by a megaloblastic type of anæmia with much poikilocytosis (as in typical "pernicious anæmia"), that the clinically and pathologically descriptive term "leukanæmia" might still perhaps justifiably be used.

Dr. MICHELL CLARKE thanked Dr. Parkes Weber for his interesting remarks and said that although from clinical appearances he had expected to find signs of blood formation in the liver, examination of microscopical sections gave no evidence of this; the appearance of the small capillaries suggested that the myelocytes in them were carried there; the irruption of megaloblasts into the blood only occurred in the terminal (prelethal) phase of the disease, and might be regarded as a last effort of the diseased marrow.

I

PROCEEDINGS

OF THE

ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

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LONDON
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1914

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Neurological Section.

October 30, 1913.

Mr. William Thorburn, President of the Section, in the Chair.

PRESIDENTIAL ADDRESS.

The Traumatic Neuroses.

My chief object this evening is to call your attention to some aspect of neurology, not with the view or even in the hope of bringing any new matter before you, but rather in order to summarize certain facts with which we are all familiar. An address of this type may aim at exploring new territory or at reducing old surveys to a small scale map, and as I am incapable of the higher I will choose the lower aim. As a surgeon I should have liked to present to you the results of over twenty years of work at the surgery of the nervous system, and possibly some of you may consider that it was my duty so to do, but I think you will agree with me that much of this ground has been so thoroughly covered by your retiring President that it would be tedious to return to the matter to-night, especially as I have neither the amount of material nor the capacity to handle it as he did last year. I shall therefore consider to-night a question with which we are all very familiar but which presents difficulties not met with in most other branches of medicine and one upon which I certainly cannot plead a lack of experience. Practising in the midst of an industrial population to the size of which the South of England—I might, perhaps, say the world—presents nothing comparable, it has been my fate to investigate a good many thousands of cases of *traumatic neurosis.* It is now a quarter of a century since I first had occasion to discuss some types of these cases and to aim at their classification, and I hope you will believe that when I express an opinion upon this subject it is at least founded upon an extensive experience and unbiased by any *ex parte* considerations.

Until about the middle of the nineteenth century accidents were generally isolated or sporadic occurrences, unaccompanied by many of the features which are so characteristic of the great disasters of modern life. Occasionally, no doubt, a fire, a colliery accident, or a shipwreck would simultaneously kill and injure a large number of people, or a battle would provide a great crowd of wounded, but such events were comparatively rare. The victims were generally left to shift for themselves; public interest was hardly concerned with their affairs; the law practically ignored them; the press did not interview them; they were unfortunate individuals temporarily or permanently thrown aside by a "dispensation of providence"; their physical injuries were treated with the skill of the day, and if they presented any complicated nervous phenomena so much the worse for them—it could not be helped and it was purely their affair.

The introduction of modern machinery, and especially of the railway, has, however, brought with it a great change in this respect, and the frequent railway collisions of years gone by were associated with conditions not previously met with. Their sudden incidence, their dramatic setting, the association of large numbers of injured, the social prominence of many victims, the wide publication of newspaper reports, and the growing importance of financial claims, all created a lurid mental picture in the injured, and indirectly affected the general public in such a way as to prepare a fertile soil for nervous disturbance in those who might themselves be injured at a later date. Many of the injuries thus sustained did not depart in type from those with which the human race had always been familiar, but there now came into prominence a number of cases presenting various forms of nervous disturbance, while, owing to the nature of the railway collision, there appeared also many cases characterized by great pain in the back. It was not unnatural to associate the nervous troubles with the very definite results of sudden over-flexion or over-extension of the spine, and it was doubtless this association which first led to the view that the seat of trouble in all, or nearly all, of these cases was the spinal cord, a view most closely associated with the name of Erichsen, by whom all cases were described as "concussion of the spinal cord."

It is no longer necessary to refer in any detail to the descriptions given by Erichsen, or to the very speculative pathology of his work, but it was only about the year 1880 that it became clearly understood by those who had opportunities of examining many of these cases that spinal concussion afforded no satisfactory explanation of the phenomena, and the theory of Erichsen was only destroyed by the work of Herbert Page, first published in 1883. Before this date it had, however, been generally realized that the spinal cord could not be regarded as the essential seat of injury; the term "concussion" was first replaced by the expression "railway spine," and as it became more obvious that the higher rather than the lower nervous centres were at fault, the expression "railway brain" was also suggested. It was now fully established that we must look to the brain rather than to the spinal cord as the organ at fault; that no organic lesion was discoverable in any of the cases, and that they presented a very marked tendency to be associated with claims for pecuniary compensation and to recover after the settlement of such claims. That the nervous symptoms following accident were essentially of psychical origin was perhaps most sharply emphasized by Oppenheim, and the expressions "neuroses," "traumatic neuroses," "neurasthenia," and "hysteria" now supplanted the older nomenclature. The separation of these neuroses from their assumed association with the spinal cord was also aided by the clear recognition and description of *sprains of the spine*—those affections of the vertebral joints, ligaments, and muscles with which, in railway accidents, the neuroses are so commonly associated—while a progressive knowledge of the functions of tracts and segments of the spinal cord itself showed the impossibility of locating any lesion which could produce the symptoms. Occasional autopsies proved that, whenever cord lesions were discoverable after injuries of the back they were associated with definite areas of hæmatomyelia which could be recognized during life and were quite unlike the neuroses; and I think we all must agree that to-day, after fifty years of careful search, there is no proof whatever that any system-disease of the cord or any case of disseminated sclerosis has been caused by injury. I make this definite statement after full consideration. Organic diseases of the spinal cord may certainly be discovered after injury or may even be developed after injury, but such diseases are not very rare, nor is injury very rare. An occasional *post hoc* is, in such common conditions, less than ever a *propter hoc*, and something more than mere coincidence must be proved before we can admit that sclerosis of any part of the cord is traumatic, save only when we have a primary segmental lesion with hæmorrhage. At least I can say that, having examined over 5,000 cases of traumatic neurosis and I know not how many cases of all forms of injury to the back, I have not yet been able to trace to injury a single example of locomotor ataxia or disseminated sclerosis.

It was, then, towards the end of the nineteenth century that the profession came to recognize fairly universally that the nervous phenomena to which we are referring must be due to some *cerebral* change, but three distinct schools of thought remained. There were those who regarded them as essentially fraudulent; there were those who still attributed them to some unrecognized but mechanical injury to cerebral cells or their connexions; and there were those who regarded them as purely psychical phenomena, not necessarily fraudulent, but reflecting certain mental impressions mainly of a subjective origin.

It was in 1889 that, in collecting and describing a large number of cases of traumatic hysterical hemianæsthesia, I was led to attempt a classification of the neuroses which had hitherto all been described under one general heading. I freely admit that my classification was somewhat formal and artificial, but its main object of separating those cases which we may call neurasthenic from those to which the term hysterical could conveniently be limited has now been almost universally accepted, while I still think that we have here a distinction not only in symptoms but probably also in their underlying pathology, and you will perhaps forgive me if I still use the original classification.

Omitting all injuries of the nervous system which are clearly known to produce gross organic changes, we find that injury *per se*, or even the mere psychical shock of an accident, may produce two types of *acute* or *immediate disturbance*. On the one hand we find a general depression of nervous activity, a condition which is largely negative; the limbs become flaccid—in extreme cases there are evacuations of the bladder or rectum—the skin is cold, or may present the condition of goose-skin popularly expressed as "the hair standing on end," mental processes are in abeyance, the pulse is weak, the face is pale, there is the well-known subjective sensation of "sinking at the pit of the stomach"; we have, in fact, an acute depression of nervous activities, acute shock, or, if I may so call it, acute neurasthenia.

Alternatively, but more rarely, the acute stage of shock takes a more definite and less widespread manifestation. There results either an hysterical outbreak of crying, laughing, shouting, or panic fright, or a stupefied and dreamy lack of all intelligent interest in the surroundings, while a distorted imagination often leads the victim to picture to himself, and perhaps afterwards to describe, events existing solely in his own imagination. In these cases the neurasthenic condition with its marked physical evidences which I have just described, may be entirely absent, or may be co-existent but distinct, and the most marked feature of the shock is a psychical and emotional explosion on the one hand, or, on the other, an arrest of mental activity and volition. We can hardly doubt that, in such cases, there has occurred a change limited to some of the highest neurones, and we come much nearer to a localization of the site of the change than in acute neurasthenia, which concerns rather those portions of the nervous system regulating the general economy.

Now I would further suggest that each of these two very different acute manifestations of physical injury or mental shock presents its chronic counterpart.

On the one hand we have *chronic neurasthenia*, which again takes the form mainly of a loss of nervous control over organic functions. This is the usual type of neurosis after, say, a railway injury, and is a type so familiar that I need hardly pause to describe the sensations of fatigue, the loss of memory, or rather of attention, the loss of capacity for business, the irritability, insomnia and dreaming, the dyspeptic troubles, the diaphoresis and diuresis, the irregularity of the heart's action, the disturbances of visual accommodation, muscæ volitantes and dilatation of the pupils, the frequent irritability of all reflexes, and in many cases the marked loss of weight.

With this condition of general depression of function we may contrast *chronic hysteria*, in which we have more defined phenomena whose seat of origin in the cerebral cortex we can almost localize. The commonest type of such hysteria is a complete or partial hemi-anæsthesia involving skin, mucous membranes, hearing, vision, taste and smell, limited by boundaries which have no relation to the distribution of nerves, and with or without paralysis or spasm, but often with unilateral facial or hypoglossal spasm. Again I will not delay over the description of this type of neurosis, but I would remind you of two familiar facts which go far to indicate its true pathology. One of these is that the patient is himself often quite unaware of his symptoms. As an example I may mention a case of supposed injury to the left testis which I saw forty-eight hours after a railway accident. I found a complaint of intense testicular pain with no other subjective symptom and no indication or description of any bruise. There was, however, complete anæsthesia of the left side of the body with retraction of the left visual field, left deafness, and deflection of the tongue to the right, and the whole classical picture was complete at a first examination, which was certainly made in such a way as to convey no possibility of suggestion. Such cases of unconscious hysterical anæsthesia are in no way unusual, and similar experiences have probably occurred to most of you. The other point to which I would call attention is that the anæsthesia of hysteria does not, like that of organic disease, entirely eliminate the functional value of the affected parts. It is again common knowledge that in retraction of the visual field due to organic disease or to poisoning, the patient, in moving about, is liable to strike against objects which fall within his blind area; but in hysterical retraction this is not the case. He does not consciously see such objects but he does avoid them. The image penetrates far enough to warn him to keep clear of obstacles; it does not penetrate to the level of perception or consciousness. And similarly in the case of anæsthesia of the limbs we find that these are not maltreated as in organic disease. Such facts clearly indicate that in the hysterical cases the defect lies in the domain of conscious perception and far above the level of reflex actions, even in their most complicated types. The anæsthesia is the anæsthesia of the somnambulist and not that of organic disease, of chloroform, or even of alcoholism. We cannot name the position of the arrested impression, but we cannot doubt that it is in some portion of the psychic mechanism. It is as purely mental as if it were voluntary, but it is unthinkable that if it were voluntary all cases should conform to so few and such remarkable types.

Having thus indicated the distinctions which we may draw between the neurasthenic and the hysterical types of traumatic neurosis, let us now return to the consideration of their causation. Of the original theory of concussion of the spine I have said enough, and the traumatic neuroses differ very widely in symptoms and in the nature of their production from the well-recognized concussion of the brain. The equally old theory that all cases are purely fraudulent is perhaps more difficult to meet, but it totally fails to explain many points, and especially the essential uniformity of the symptoms, although there are certain facts in its favour which we cannot ignore. From the early days of railway accidents it was found that passengers were much more liable to nervous disturbances than were officials who had less claim to heavy compensation. It was also admitted that the presence of a severe organic injury, such as as a bad fracture, an amputation or other cause of disablement, usually prevented the appearance of the neuroses. And it was notorious that the financial compensation was constantly followed by rapid recovery. Still more significant was the fact that in some cases there was not and could not have been any physical injury whatever. One of the most marked examples of hysterical hemi-anæsthesia which I have met with was the case of a young lady who was walking along the pavement when a passing wagon of hay collapsed, and the whole load fell to the ground around her. On her own statement, and that of bystanders, she was not touched by the hay and was merely frightened, but she developed a typical hemi-anæsthesia which persisted at least until her action was tried at the Manchester Assizes. And again, the nature of the injury or fright bears no relation to the nature of the symptoms. In the year 1885 I had occasion to see a large number of people who were simultaneously injured at Morecambe by the collapse of a pier which threw them into the water. A few suffered from colds and respiratory troubles, and I think one or two died from pneumonia, while few, if any, presented surgical injuries such as cut or bruises, but all whose cases were tried presented symptoms identical with those of the victims of railway collisions, including even in many instances severe aching and pain in the back. The common factor in these cases is, then, the question of compensation and not the nature of the injury. On the other hand, we find that when this common factor is excluded injury alone seldom causes a traumatic neurosis. Among 500 victims of the earthquake at Messina Bianchi found no case of traumatic neurosis, and a similar immunity followed that at Valparaiso, while in recent years we have seen many motor accidents which closely resemble railway collisions, but which do not produce serious neuroses in the owners of cars or in their friends and companions. Thus, then, the question of compensation cannot fail to be regarded as a most important factor.

It is true that cases of neurosis are occasionally met with in which there is no financial issue, but which do not differ from the ordinary type. Such cases occur under varying conditions, but incidentally we may note that there is often a very strong element of suggestion. I have seen a typical hemi-anæsthesia in a healthy farmer who was thrown from his own dogcart; he had some cerebral concussion and was told—or thought he was told—by his medical adviser that symptoms might develop in six months' time, which they did! Of very great interest to me in this connexion was a case referred to by Dr. Ormerod in his Presidential Address to this Section, in which a hemi-anæsthesia followed the operation of gasserectomy,[1] because I had myself shortly before hearing the address had an identical experience; and here also the element of suggestion is very clearly defined. Of further significance is the fact that those who are drunk or heavily asleep at the time of an accident show little tendency to subsequent neurosis, although they are by no means debarred by such drunkenness from claiming compensation, and that children are much less liable to these disturbances than are adults.

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[1] *Proceedings*, 1911, iv, p. 9.

The fact remains that in the great majority of cases the element of compensation is very prominent, and that when it is absent we usually find some other powerful element of suggestion, while those who escape the disastrous influence of the financial claim are those who from youth or other causes are at and after the moment of the accident but little liable to strong mental impressions. Such considerations leave us with hardly any doubt that the psychical basis of the neurosis is a complicated one and that it presents at least two elements—the initial shock, acute neurasthenia or acute hysteria, and the subsequent mental attitude to the question of compensation. In the case of hysteria there are probably still other factors, to which we shall refer immediately.

Dealing first, however, with neurasthenia, it is fairly obvious how the disease is evoked and how it is truly a mental disease and not an imposture. The primary acute shock or acute neurasthenia is probably well known to many of you by personal experience. I have myself once been in a collision at sea and once experienced an earthquake of moderate severity. I have realized the highly uncomfortable effects of such happenings, and in the first case felt distinctly unwell for several days, in the second for a few hours, after which short periods the nausea, want of vigour and general lack of nerve tone passed away. But now let the question of compensation be introduced, and we have at once a number of important new factors which, apart from any suggestion of malingering, will influence first the mental and then the general physical condition of the shaken man. Two of the strongest human passions are *fear* and *anger*, and both are brought in to aid the effect of shock. The ordinary man begins to fear for his own health, for his capacity to transact his business, and for the possible future results to wife or family. He has often heard that after the shock of, let us say, a railway accident symptoms are liable to be progressive, to develop at remote periods and to endure indefinitely. In this condition of expectation of disaster he consults probably both his medical and his legal adviser. The former has often a limited experience of traumatic neuroses; he knows that his patient is and always has been an honest man; he may have doubts in his own mind as to whether organic disease of the nervous system does not follow shock. In any event, he enters upon his task of relief and encouragement with a more serious aspect than he would otherwise assume, he takes careful note of all minor symptoms, and he probably has to write reports to the solicitor, which he is asked to make "as strong as possible." The solicitor is an even graver danger; it is his professional duty to obtain the largest possible amount of compensation for his client, and in so doing to emphasize to the utmost any loss, inconvenience or suffering which the latter may have sustained, and especially to guard against the making of any settlement before all possible future inconveniences have been excluded. None of the people thus concerned have any intention to exaggerate, but each mind reacts upon the other, and we have established a complete vicious circle as a result of which the unfortunate patient tends to grow daily worse.

So far *fear* has been principally concerned in the fixation of the acute phase, and now *anger* often begins to play its part. The injured man tends instinctively to blame him or those to whom he feels his injury to be due, and his resentment is at once increased when the defendant commences to make his investigations of the patient's condition. As the one solicitor uses every expression to magnify the injury, so does the other try his utmost to minimize it, and the defendant's medical adviser comes upon the scene, where his presence is often quite absurdly resented, and again recalls to the patient's mind every detail of his fears and his discomforts. There often follow further examinations and solemn conferences, due to our legal system of arraying on each side as many witnesses as possible ; every symptom is again and again described, discussed, and thoroughly written up in numerous reports. Could we devise a worse method of treating the primary neurasthenia, and is it wonderful that the original depression finally assumes the most alarming proportions? Such then are, I think, the essential factors in the causation of the ultimate condition, and I say without hesitation that, on the one hand, I have rarely seen cases in which I felt that there was any conscious fraud, while, on the other hand, in the vast majority it has not been difficult to trace the gradual accretion of these psychical disturbances. And hence it follows that the compensation question plays so large a part in the evolution of the neurosis, and that when this question is finally closed the neurosis generally recovers as readily as in the ordinary shock where no such question is involved.

In the cases which we have spoken of as hysterical rather than neurasthenic there is, however, probably another condition of mental disturbance which modifies both the original clinical picture and the subsequent result. In these cases there is, as a rule, a more apathetic and less irritable mental condition. The patient is less insistent upon his minor inconveniences, he makes less profession of his illness, but he is really more ill and has such definite symptoms as anaesthesia and the like. Many years ago Charcot and others showed how under the influence of hypnotism the phenomena of hysteria may readily be produced, and, following him, I suggested that the accident plays the part of a hypnotizing agent. In the rarer type of acute hysteria immediately following the accident we see at times phenomena closely similar to those of the hypnotic state, and we find the recipient of the shock behaving much as does the somnambulist. Within this year I have seen a young man who, being in a railway collision in Yorkshire, walked away from the scene of the accident and wandered for a day and a half across hills and moors, only to return to waking life at a town twenty miles from the scene of the disaster. Such examples of what is practically somnambulism are not very rare and I have previously recounted some interesting cases. Others, again, do not wander afield, but they retain no recollection of events or they describe at a later date imaginary events of the nature of dreams. In these cases, then, we have apparently a hypnotic state liable to be followed, as in Charcot's experiments, by anæsthetic and other phenomena of a more definite type than those of neurasthenia.

That such is the origin of the symptoms I have tried to prove by re-inducing a hypnotic condition and by suggesting a cure, and in this way I have in a few cases rapidly abolished hemi-anæsthesia of long duration, but I abandoned such experiments years ago, as I thought that although I could obtain some immediately good results, the effect of designed and elaborate hypnotization was to intensify the mental deterioration and increase the general nervous condition. I did, however, obtain a sufficient number of results to satisfy myself and others that therapeutic hypnotization followed by a suggestion of cure might remove symptoms which had probably originated in traumatic hypnotization with the suggestion of paralysis.

I have dwelt at length, Gentlemen, on what I regard as the main elements in the development of the traumatic neuroses, not because I had anything very new to say, nor, indeed, have I substantially modified my own earlier descriptions, but because it is on a consideration and full appreciation of these ætiological factors that we must base our prognosis and our treatment.

With regard to prognosis, it is essential that we should withdraw the irritating question of compensation, but apart from this we have a few other considerations which may assist us not a little.

Racial influences play some part, and of those amongst whom I have the largest experience I should say that Jews suffer most and that the Celt has a greater tendency to neurasthenia than the Teuton, but that the more defined examples of hysteria are at least as common in the Teuton as in other races. A family history of neurotic taint or a history of bygone neurosis on the part of the individual is obviously of bad omen. The educational level of the sufferer appears to make little difference, and, if anything, I should be inclined to say that the more ignorant and uneducated suffer most. Alcoholism and other similar depressing influences are serious complications.

As regards sex, men certainly at one time appeared to suffer more than women—at least in those cases which fell within the common law and were tried in the High Courts, but this is probably due in the main to the fact that their financial position is more complicated, the stake is greater, and the negotiations more prolonged. Thus the sexual distinction hardly applies to cases falling under the Workmen's Compensation Act, to which I shall have occasion to refer in a few moments.

Children, it is important to note, are almost exempt from these neuroses, partly because the child has not the underlying feelings of fear and anger which so prey upon the adult mind, and partly because his financial value is much lower and he is not subjected to the strain of litigation.

Finally, we have to note that in all cases the longer the duration of symptoms before settlement the longer they are likely to persist after settlement, that the stigmata of hysteria are more fixed and persistent than the more irregular disturbances of neurasthenia, and that the fixation of these stigmata is much intensified by frequent examinations and by the impressive ceremony of medical consultations.

Such considerations being borne in mind, we may now ask ourselves what is the final prognosis. So far as I know all cases recover—up to a certain point. I have not been able to find any derelicts in workhouse hospitals, nor have I ever been consulted in cases of such old standing that I could regard the disabilities as permanent. It is probably more easy in a provincial city than in London to keep in touch with old patients, and I have in the last twenty years or so often met with people in whom, in earlier days, I had seen marked traumatic neuroses. So far as my personal experience goes all these people have been able ultimately to return to their ordinary methods of life. On the other hand, a considerable number present some permanent loss of nervous balance: they are unstable and neurotic. But how far such conditions were precedent to their accidents I am unable to say, and no elaborate examination of this question would be possible or justifiable in view of the danger of re-exciting the original disturbance. I may say, however, that on three occasions I have met with people about whom I had in the past been consulted for traumatic hysterical hemi-anæsthesia and who, some years later, have had a second accident in which the compensation difficulty again arose, that all three again presented an exact repetition of their earlier symptoms, and that all claimed to have made a perfect recovery after their earlier experience. Whether they had actually done so I am unable to say.

And, lastly, we come to the question of treatment, which is inextricably bound up with that of compensation, as no treatment is of avail until after the removal of the mental disturbance which is mainly responsible for the disease. Before the year 1897 the traumatic neuroses were commonly the subject of litigation under the Common Law and the Employers' Liability Act; reference was to a jury, or occasionally to an arbitrator, and compensation was paid on the basis of what is now known as a lump sum. Under these circumstances an endeavour was made to determine an ultimate prognosis at the time of trial, and I think that, on the whole, this was fairly done, a margin being allowed for recovery after the close of the action. When the verdict had been given there were no longer any of the mental disturbances to which I have so fully referred. The lawyers ceased from troubling and the client was at rest. The consultants and specialists disappeared from the scene, and the medical adviser resumed his normal attitude to a patient for whom encouragement meant recovery. But since the passing of the Workmen's Compensation Act a new type of compensation has arisen, and not unnaturally the traumatic neuroses have been modified thereby. Formerly these neuroses were generally due to accidents or shocks of considerable severity, and especially to those in which many people were simultaneously injured or other dramatic associations obtained. Now we find them following crushed fingers, bruises, sprains, burns, fractures, and the other common sporadic accidents of civil life. And in the majority of such cases there is little or no tendency to exaggerate the early symptoms; if these disable the individual it is temporarily sufficient, and the nervous system is left in peace. It is probably for this reason that the hysterical type is quite rarely met with in cases coming within the Workmen's Compensation Act, and that I only remember to have seen one example of hysterical anæsthesia, the single case being due to an injury to the skin so slight as not in itself to be a cause of disablement. The Act has thus apparently not produced cases of the fixed or hysterical type, nor do we find among those who come under its operation the rapidly developed or acute neuroses. On the other hand, we now meet with a very large number of delayed neuroses, the course of which it is extremely difficult to terminate. A time arrives when the primary organic injury has been recovered from to such an extent that the injured man or woman would feel able to work and would formerly have made a reasonable attempt to do so. The first efforts would be more or less trying, but hunger is a great stimulant, and, with the goodwill of employer and fellow-workers the early difficulties would have been overcome, and the injured person would soon have been earning his original wages or would have been usefully and beneficially employed in some other work for which he was fitted. But under the new conditions the effort to return to work is too often not made. As before, the organic injury is recovered from, but there now arise the elements of fear and anger. The injured man is afraid that, by returning to work of any kind, he will prejudice his future right to compensation, and he is with justice afraid that even a slight handicap will destroy his position in the labour market. His employer, who has paid an insurance company to relieve him of all liability, is often not anxious to reinstate a somewhat damaged workman, and has no reason to meet him halfway or assist his gradual return to work. And again arises the usual dispute and the feelings of grievance or of anger, causing a change of mental attitude which is well expressed by saying that what was at first an accident has now become a "case." These are not the conditions suited to assist one who has had some shock and perhaps still feels some pain, while inactivity has rendered his muscles soft and reduced his nervous energy. Hence there develops once more a neurasthenia of a type less commonly seen in the last century, less acute in onset, far more insidious, gradually increasing and becoming so intensified with time and repeated applications to an arbitrator that it often prevents the unfortunate victim from ever again returning to a useful life. And, unfortunately, the legal method of compensation tends directly to produce such an issue. If the case is taken before a County Court judge the witnesses on both sides must agree that, at that particular moment of time, recovery is incomplete and the man is unfit for full work. The judge has no option but to continue the compensation in whole or in part, and in so doing to continue the causes of neurosis; and it is only by the "lump sum" method of settlement, with its final removal of such causes, that we can hope for recovery. Especially do we see this in the case of women. Under the common law the traumatic neuroses were rare in women, probably because the cost of compensation was comparatively small as compared with that of men, and cases were readily settled. Under the Workmen's Compensation Act this is not my experience. I do not know the percentage number of women engaged in occupations which carry serious risk of injury, but I do know that, since 1897, the proportion of those whom I see with traumatic neurasthenia has very greatly increased. We do not meet to-night as statesmen or as legislators, but I think we may agree that much would be done for the prevention of neuroses, and for the ultimate good of their unfortunate victims, if, in such cases, the weekly payment of compensation and the weekly recurrence of the stimulus to nervous disturbance could be replaced by some system which would eliminate this fertile source of neurasthenia.

A few more words as to treatment and I have done. Important as is the question of legal settlement, something may be done before it is effected and much may be done afterwards by judicious management based on a recognition of the psychical disturbance. We must try to remove all subsidiary conditions which remind the patient of his accident or which focus attention upon his symptoms, and it is therefore generally essential to isolate him from his friends and relations and from his past surroundings. For the well-to-do travel in suitable company and as much distraction as possible will best effect this object. For those who are unfit for travel or unable to afford it institutional treatment of some type is the best substitute. And very much depends upon the medical adviser—more, perhaps, in these cases than in any other, except those requiring special manipulative skill. I cannot, for reasons which I have given, advise hypnotic suggestion, but the stimulus of encouragement and the restoration of confidence are essential, and without these there is little hope of success. It is as wrong for a physician to take charge of such a case unless he is himself confident and knows that he inspires confidence, as it would be for a surgeon to perform an operation in ignorance of the pathological conditions and anatomical relations of the parts with which he was dealing. Nine years ago, in a Presidential Address to the Neurological Society, Dr. Sharkey[1] spoke strongly of the importance of selecting the right nurse for each case of neurasthenia or hysteria. I should like to endorse every word he then said and to add that the same principles apply to the medical adviser and that it is perhaps mainly on his tact, firmness, and discretion that the ultimate issue will depend. Let him use any therapeutic means he chooses—blisters, cauteries, pills, high-frequency currents, or the writings of Mrs. Eddy—the one essential is that he should convince himself and his patient that all will be well, and if he finds that he cannot do this he will, if he is wise and honest, transfer his patient to one who can.

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[1] *Brain*, 1904, xxvii, p. 16.

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Neurological Section.

December 11, 1913.

Mr. William Thorburn, President of the Section, in the Chair.

Case of Friedreich's Disease, following Diphtheria.

By James Taylor, M.D.

H. P., aged 21, admitted December, 1907; discharged March, 1908; diagnosis, "post-diphtheritic ataxy." Readmitted October 31, 1913. Had diphtheria in April, 1907, followed apparently by post-diphtheritic paralysis—diplopia, regurgitation of fluids, weakness in legs, difficulty in walking. Now has ataxy. Knee-jerks not obtained. Plantars: Right doubtful, left extensor. Articulation peculiar; tremor; no nystagmus; slight scoliosis. No deformity of foot, although left foot different from right. Family history negative.

Case of (?) Friedreich's Disease.

By James Taylor, M.D.

W. H. D., aged 42. Unsteady gait for five years; no pains. Upper limbs not so accurate as formerly. No sphincter trouble; no ocular trouble. Articulation peculiar (? Wiltshire accent). Now ataxy; no scoliosis; no foot deformity; no anæsthesia. Knee-jerks present, not so active as normally, but more active than on admission; extensor responses from both soles.

Labyrinthine Syndrome (probably of Central Origin).

By H. G. Turney, M.D.

F. G., aged 20. Admitted October 10, 1913. Family and personal history quite negative. Patient was quite well till twelve months ago, when she first noticed giddiness and occasionally fell down. Later she noticed deafness and was troubled by noises in the head and occipital headache. There is no history of middle-ear trouble. During the last three months there has been some failure of vision and the hearing has got much worse, especially on the left side. A week ago, in connexion with a particularly severe headache, there was some vomiting, but apart from this there has not been more than nausea.

On examination: A well-nourished, fairly intelligent girl, with a somewhat masklike expression. There is no definite paralysis of trunk or limbs. The knee-jerks are present on both sides, but the left is much the brisker of the two. Achilles-jerks are present and plantar reflex is of the flexor type. The abdominal reflexes are not obtained. There is neither muscular spasm nor hypotonia nor wasting. There is no loss of sense of position or any other defect of sensation. The gait is of cerebellar type without any consistent deviation to one side or the other. Romberg negative. As to evidence of asynergy, she can rise from the supine to the sitting position only with the greatest difficulty and there is obvious want of co-operation between the trunk and the lower limbs. In the upper limbs there is some irregularity of movement when a full vessel is carried to the lips, but there is no suggestion of hypermetria. Movements of pronation and supination of the forearm and hand are not performed as rapidly as in a normal subject, but the defect cannot be said to amount to adiadochokinesis. The patient can draw horizontal lines to meet a vertical with a fair degree of accuracy. Eyes: The immobility of the head is particularly noticeable when the attention is directed to the one side or the other. The eyes turn in the direction indicated before any movement of the head is made, and more commonly the head is not moved at all. There is distinct protrusion of the right eye, but v. Graefe's sign is negative. The pupils are equal and active. There is no definite ophthalmoplegia externa, but patient notices diplopia with extreme movements to either side. There is coarse nystagmus in every direction. As regards the fundi, Mr. H. Fisher reports (October 10): "Each optic disk is rather high coloured and each is ill defined at its upper margin, which is rather striate or frayed looking. There is very little, if any, exudation in either papilla and no hæmorrhages. The physiological pits are not obliterated. No other fundus changes. I think that the appearances can hardly be passed as physiological. The refraction is + 1·5 or 2." Ears: On the left side complete deafness both to air- and bone-conduction. On the right side watch heard at 8 in.; bone-conduction much impaired and only high notes heard. No sign of disease in middle-ear apparatus. Bárány's pointing tests negative. Patient complains much of tinnitus, which is not referred to one ear more than the other. It is worse with any movement of the head, but particularly when she stoops forward. The other cranial nerves are normal. There is no enlargement of the thyroid. The pulse-rate is from 70 to 80.

In the six weeks that have passed since patient's admission the main change has been a marked increase in the deafness on the right side and in the rushing noises in the head. The condition of the eyes has not altered.

DISCUSSION.

Dr. FARQUHAR BUZZARD said that through the kindness of Dr. Turney he had had more than one opportunity of examining this case, which he regarded as a difficult one for diagnosis. He felt sure that the optic neuritis had definitely increased in the last few weeks, and that the facial weakness was also advancing along with the increasing deafness. Bilateral tumours of the auditory nerve might account for the complex symptomatology, and cases of this kind had been described by Dr. Grainger Stewart and others. He ventured to think that such a diagnosis, although hardly to be urged dogmatically, was at all events worthy of consideration.

Dr. T. R. ELLIOTT, F.R.S., urged that exophthalmos and changes due to interference with the cervical sympathetic could be occasional features of auditory nerve tumours. He quoted a case of a man with a large tumour on the eighth nerve of one side; the fifth and seventh nerves were very slightly affected, though there was considerable ataxia from pressure on the middle cerebellar peduncle. The eye on that side showed obvious proptosis, the eyelid was retracted, and the pupil larger than the other. Optic neuritis was very slight. The patient succumbed to an attempted decompression, and it was certain that there was no other cause for the irritation of the cervical sympathetic than the auditory nerve tumour, which pressed on the side of the pons in the region where thromboses cause palsy of the cervical sympathetic. Consequently there was no need to explain the exophthalmos in Dr. Turney's case by supposing that the lesion lay within the central nervous system, or had any connexion with a hypothetical innervation of the thyroid. The case quoted by Dr. Elliott had slight uniform enlargement of the thyroid, but it was in no other respect a case of Graves's disease, and the eye changes did not look like those occasionally seen on one side in Graves's disease.

Mr. SYDNEY SCOTT hoped that Dr. Turney would have the opportunity of recording the vestibular reactions to the rotation, caloric and galvanic tests in his patients, for he found them of the greatest value in making a diagnosis in such a case. It would be interesting to observe whether the galvanic tests alone gave a positive reaction while the caloric and rotation tests were both negative, or whether all three tests proved negative. Should the symptoms be due to auditory nerve tumours, it would perhaps be useful to bear in mind that auditory nerve tumours showed a tendency to invade the labyrinth by way of the internal auditory meatus, and this would receive consideration in carrying out any operative treatment which might be devised.

Sclerodermia; Neuropathic Œdema; Functional Hemiplegia.

By H. G. TURNEY, M.D.

B. M., AGED 20, admitted November, 1913. Patient had a most unhappy childhood, the mother being a woman of violent temper, who systematically ill-treated her. The father is very slow mentally, but not actually deficient. Her present illness began about three years ago with pains in the left side of the head and face and down the right side of the body. The pains were accompanied by swelling of the affected parts. There have been intermissions, but for the past two years patient has depended upon crutches.

On admission: The face was much swollen, especially about the eyes. When first observed, the swelling was more marked on the right side, but later the œdema appeared about the left eye and then disappeared. There was also a mesial swelling below the jaw. The œdematous element of this has subsided, but on palpation below the chin the muscles are felt to be unnaturally hard, and the attachment to the tongue is such that this organ cannot be protruded beyond the teeth. The lingual mucosa is dry and rough, but not more so than might be due to habitual mouth-breathing. The power of opening the mouth is much limited, partly from the changes in the floor of the mouth and partly from inability normally to extend the lips. The expression is dull in the extreme and the voice feeble. The right upper limb is kept rigid in a condition of flexion at all the joints. The attitude of the hand is that of tetany, but it is possible when the patient's attention is diverted to get both hand and fingers straight from the wrist. The dorsum of the hand was at first surmounted by a firm, œdematous swelling with a reddish discoloration which extended on to the proximal phalanges. All this has now disappeared, the colour changing first from red to a dirty brown. The skin is now abnormally firm, smooth, and inelastic. It is fixed down to the underlying tissues and takes some share in the limitation of movement of the fingers. The whole limb is cooler to the touch than its fellow. It is evidently the seat of considerable discomfort to its owner, but hardly of actual pain. There are no local indications of vasomotor change or instability, but dermatographia is always present on the trunk. When the œdema was present in the face there was a marked tendency for the parts affected to sweat.

On the neurological aspect there is a contracture of the right arm and leg affecting all segments. In the leg the contraction of the calf muscles is such as to keep the foot in a position of equino-varus. There is right-sided hemianæsthesia to all cutaneous impressions over the lower half of the body up to a level which varies between the umbilicus and the nipple, but sense of deep pressure is maintained. In the upper limb the dorsum of the hand and fingers on the right side are also anæsthetic, but the arm is comparatively little affected. The condition, however, varies from day to day. The anæsthesia also involves the left side of the face, but does not extend up to mid-line. Deep reflexes are normal; the plantar on the right side is not obtained. No affection of cranial nerves. No optic neuritis. There is a moderate degree of contraction of the visual fields.

Patient passes the time in a semi-somnolent condition. She is often sick without apparent cause. When the swelling was at its worst there was much difficulty in swallowing, but there was never any stridor with breathing.

Case of Diffuse Sclerodermia.

By E. Farquhar Buzzard, M.D.

D. B., aged 33, has lived for many years in South Africa and had three or four attacks of malaria in Rhodesia about fifteen years ago. Otherwise has had good health. Married, with two healthy children. For four years previous to the onset of his present illness he has experienced occasional dizziness on stooping or on sudden changes of position, but these have not recurred since his present illness commenced.

Present illness: Onset insidious in December, 1912. He remembers that at Christmas-time his hands were rather puffy and stiff, but not painful. The stiffness spread into the sides of his chest and into his groins and then down the back of his legs, but he had no swelling anywhere except in the hands. The œdema was never extensive and disappeared about the end of July, 1913. During the last few months of his illness he used frequently to find small lumps forming on his fingers. He would first feel as if there were a bit of grit buried in the tissues which pricked him when he pressed it and then there would gradually appear a red, hard swelling which would ultimately peel off like a scab. At one time these places were so thick that they prevented him using his hands for such purposes as lacing his boots and so on. In April, 1913, he was supposed to be rheumatic and went in for bath treatment but got no benefit. In June he was at Durban and found that bathing caused severe vasomotor disturbances in his hands, which became quite blue or black with cold. This tendency to a condition like Raynaud's disease has persisted ever since. About this time he was treated with thyroid, but this made him worse rather than better. In August, 1913, he had severe pain in the knees, then in the left shoulder followed by the right. It returned to the knees again and then to the shoulders, and then was referred to the chest, especially the præcordial region. He believes that a doctor heard some pericardial friction on one occasion. The pain and stiffness and almost complete helplessness continued until October 18, when he left Cape Town for this country. During the voyage he lost all his pain but remains somewhat stiff.

The pigmentation, which is so marked a feature, has been present for some months, and the white spots on his chest and shoulders have been noticed since the end of April. In addition to his stiffness, his loss of appetite and other discomforts, he complains that the inside of his mouth sometimes feels quite dead or numb, that the right side of his face has been becoming more stiff, and that the point of his nose often feels quite frozen. He has lost over 30 lb. in weight and he has had a certain amount of irregular pyrexia throughout his illness.

Present condition: Although at first sight he presents a healthy appearance, closer examination shows that the colour of his skin is more yellow than that of true sunburn, although he is naturally dark-complexioned and dark-haired. Deep brown or black spots are numerous over the face and neck, limbs and trunk, but speaking generally the pigmentation is most marked over the neck, forearms, and legs. Over the back and front of the chest, arranged more or less symmetrically, are numerous small white patches looking like scars and somewhat rounded in shape. At first sight they suggest old acne scars rendered prominent by darkening of the surrounding skin, but this origin is not confirmed by further investigation. The skin on the back of the fingers and back of the hands is almost entirely adherent to the subcutaneous tissues and cannot be picked up. The natural wrinkles have almost completely disappeared and the skin generally on those parts is a dirty yellowish-brown colour. On the palmar surface of the fingers and hands the skin is pinkish, soft, and almost sodden-looking, the large wrinkles being well marked but the finer ones less prominent than usual. There is a general diminution of muscular strength and decided interference with some movements, especially in the right arm, and he cannot fully abduct the arm at the shoulder. Full extension of the forearm at the elbow and of the wrist and fingers is impossible, and on an attempt to close his hand the tip of his middle finger only reaches to about an inch from the surface of the palm. X-ray photographs present no evidence of bony or arthritic changes and the interference with movement appears to be entirely due to thickening of the connective and muscular tissues. Similar changes in less marked degree are present in the lower extremities and all movements are slow and clumsy. The right side of the face is distinctly thicker and stiffer than the left. There are no signs of any organic disease of the nervous system, no alteration in the reflexes beyond a certain difficulty in obtaining the tendon-jerks, and no interference with sensibility. The blood and urine are normal and the complement-fixation reactions for syphilis and tuberculosis absolutely negative.

Case of Acute Cerebellar Ataxia in an Adult.

By E. Farquhar Buzzard, M.D.

Woman, aged 38, gives the following history: When in good health in September, 1910, on a certain Friday was seized with shivering and general malaise. This continued until the following Tuesday morning, when she woke up to find herself hardly able to speak, and quite unable to use her arms or legs properly. From that time until the present there has been gradual but slow improvement, so that she is more able to talk clearly and able to use her hands for most purposes. At the same time she is still unable to stand or walk without some support.

Present condition: The function of the cranial nerves is normally carried out with the exception that she displays a marked amount of ataxic dysarthria. The strength and sensibility of her arms are perfectly good, and she only displays a slight amount of cerebellar incoördination when tested severely. The lower extremities are powerful enough, but widely ataxic when she attempts to walk. There appears to be very little impairment of sense of position. There are no nystagmus, no ophthalmoscopic abnormalities, and no organic changes in the reflexes. The patient complains of no giddiness or tinnitus.

The case resembles those not very uncommonly seen in children, but the condition must be very rare at the age of 35.

Case of Cerebellar Ataxia.

By F. E. Batten, M.D.

P. J., aged 5, was quite well till the age of 2½, when she had an acute illness; since that time she has been unable to walk steadily. She now presents the typical picture of a cerebellar ataxia—slow articulation, hypotonia of limbs, no nystagmus, &c. Normal reflexes. When walking she has a tendency to go to the left. She is quite intelligent, although her placid, fixed expression suggests that she is not normal in this respect.

Shown for comparison with Dr. Buzzard's case.

Glioma of the Cerebellum ; Recovery after Simple Drainage of Cyst.

By F. E. Batten, M.D.

K. R., aged 8. In November, 1911, complained of headache, attacks of vomiting and unsteady gait, which she had had for two months. On examination she had double optic neuritis and symptoms pointing to a tumour of the cerebellum, the ataxia being rather more marked on the right than the left side. A subtentorial decompression was performed on November 14 and a cyst containing a yellow fluid, which rapidly clotted, was found in the left lateral lobe. The wall of the cyst was formed of new growth which infiltrated the lobe of the cerebellum. A small piece of the growth was removed and on microscopical examination shows the appearance of a glioma. The child slowly recovered, and now, two years later, seems quite well.

Case of Toxic Polyneuritis due to the Virus of Poliomyelitis.

By F. E. Batten, M.D.

E. H., aged 20, had an acute attack of "influenza" in August, 1898, when aged 5. This was followed by paralysis, and he was in the Children's Hospital, Great Ormond Street, suffering from a condition which was variously diagnosed as peripheral neuritis and poliomyelitis. Pain and tenderness were a marked feature of his illness, but he never had any loss of sensation. The boy slowly recovered, and now, fifteen years after the illness, presents a dwarfed appearance, being only 4 ft. 2 in. in height. He has a marked lateral curvature of the back, a general wasted condition of the legs and arms, but with no such local wasting of muscles as is commonly seen in most cases of poliomyelitis.

Dr. Farquhar Buzzard lodged a protest against the titular description of this case. Without arguing the question as to whether the virus of poliomyelitis has been proved to be capable of causing a toxic polyneuritis, he felt that the only reason for labelling this very obscure case as one due to the virus of poliomyelitis was that it had an acute onset in the month of August in the year 1898. Until we were in possession of more reliable evidence with regard to the manner in which the virus of poliomyelitis might influence the peripheral nerves, it would be in the interests of science if cases like the one under discussion were not given such dogmatic titles.

Case of Hysterical Brachial Monoplegia.

By PURVES STEWART, M.D.

W. E. B., AGED 21, carpenter. Ten months ago, when turning on an electric light with his left hand, an explosion occurred. His left hand immediately became rigidly fixed in the position of grasping an imaginary object. The lamp burst and cut the palm of the hand, which did not bleed. Patient was flung backwards by the shock, not unconscious. The contracture of the hand increased, and it became rigidly flexed at the wrist and elbow, but without loss of sensation. Jerking movements appeared, and seven weeks after the accident, under an anæsthetic, the limb was straightened and put up in plaster of Paris. The jerkings stopped. Two weeks later the fingers began to flex within the splint. Under an anæsthetic the hand was then straightened out, and the limb became totally flaccid, and there was loss of feeling as high as the elbow. It has since remained flaccid and the anæsthesia has descended to the shoulder. Patient states that amputation was suggested, and that he ran away from hospital in consequence.

Present condition: No abnormality except in left upper extremity. Optic disks, pupils and cranial nerves normal. No affection of special senses. Total anæsthesia and analgesia as high as shoulder-joint. Total flaccid paralysis of left upper limb, including trapezius and scapulo-humeral muscles. Latissimus dorsi contracts energetically on both sides when coughing. Supinator-jerks present on both sides. Electrical reactions normal. Pins can be passed through the skin in the anæsthetic area without drawing blood.

Case of Nystagmus.

By Harry Campbell, M.D.

H. W., aged 36, for two years has suffered from lateral nystagmus on turning the eyes to the right. The nystagmus is accompanied by giddiness and widespread nervous perturbation. The trouble incommodes him in his work as shop assistant, especially when taking down articles from shelves. Turning the head to the right while the eyes are directed forwards does not cause nystagmus. Turning the eyes to the right with closed lids causes nystagmus with little, if any, giddiness. He has had some dull occipital headache. Beyond the nystagmus and a moderate defect of hearing no abnormal nervous condition can be discovered objectively.

Two Cases of Thomsen's Disease.

By James Collier, M.D.

These patients are the second and third members of a family of four girls. The eldest child, aged 17, and the youngest, aged 6, are not affected. There is no history of any other members of the family being affected with a similar condition.

M. M., a well-built and healthy-looking girl, aged 11, was quite normal and moved like other children until she was aged 9, when it was gradually noticed that she seemed stiff in her movements and had difficulty in walking upstairs. These symptoms have gradually increased. She walked very badly and stiffly after sitting down, and on getting up she could hardly move, but after taking a few steps the stiffness passed off and she walked fairly well. If, in walking, she happened to stumble, the whole mechanism seemed to be upset and the stiffness returned. For this reason, if she fell down in the street, she could not get out of the way of the oncoming traffic with any celerity. She could cut up her food, but held her knife in a peculiar manner. She had difficulty in letting go objects that she held.

When stripped this patient presents an unusually fine physique and would serve as an admirable model for a "physical culture" advertisement.

There is a diffuse hypertrophy of the musculature, well proportioned and rigidly symmetrical. The muscles that attract attention most are the vasti, the bicipiti crurium, and the trapezii. Relaxation of the orbiculares palpebrarum, after tightly shutting the eyes, is definitely slow. There is definite weakness in both grips and in the dorsi-flexors of both ankles. After gripping tightly with the hands the attempt to unclasp the fingers is characterized by the slow and deliberate relaxation of myotonus, but this phenomenon varies greatly in degree at different times. The muscles of the forearms show a distinct myotonic reaction to strong faradism and to galvanism. These are the only muscles in the body which show slow relaxation and the myotonic reaction. There is undue resistance in all four limbs to initial passive movements, which rapidly passes off when these movements are repeated.

Successive alternating movements, if actively performed at any joint, show the following phenomenon: After the movement has been performed several times, it is checked by a spasmodic contraction of the muscles concerned, which can be both seen and felt. This spasm rapidly passes off, to return again when the movement is repeated. There is a peculiar absence of neatness and quickness in the movements of the fingers and hands, and bilateral synergia is present with several movements. Examination of the lower extremities when she lies in bed does not reveal any slowness of relaxation, but this is conspicuously seen when she walks. She rises from a chair slowly and takes small, slow steps, each step becoming longer and quicker than the last until she gets into her usual stride, which is always somewhat slow and clumsy. She cannot run properly, and when she attempts this act she seems "muscle-bound," and tramps along in an ungainly manner. She cannot rise from the floor quickly—there is a sluggishness about this act which is in striking contrast with her athletic appearance. There is no muscular wasting. Sensibility and reflex action are normal. A portion of muscle has been removed for microscopic examination.

A. M., aged 14½, sister of the above, was first noticed to have difficulty in running and in going upstairs when aged 9. Since then she has tended to improve, and is now able to work as a spinner. She presents the same spasm on the performance of successive movements as does her sister, and has a similar clumsiness and slowness in walking, &c., and some of her muscles are large. No characteristic slowness of relaxation has been made out. Her upper extremities are abnormally weak and seem to tire unduly.

DISCUSSION.

Dr. COLLIER remarked that the two patients shown were of a type not uncommonly described in the records of this rare disease, in which the muscular spasm did not disappear on continued exercise of the limbs, but after an initial slight improvement it persisted in much the same degree. The tendency to the locking of a joint by visible and palpable spasm when a series of similar movements of a joint were made was characteristic of Thomsen's disease. The spasm appeared with the more massive movements and not with the more delicate movements. For example, in the younger of the two patients the upper limbs were markedly affected and yet the fine movements of the fingers, such as sewing, &c., were little interfered with, just as in many recorded cases where the muscles of the jaws, tongue, &c., were severely affected for the acts of mastication and swallowing, articulation was never interfered with. The weakness of the upper extremities in both the cases with the splendid muscular development suggested a possible relationship between Thomsen's disease and the condition which had been described as "hypertrophia musculorum vera." The immediate return of the muscular spasm on the throwing in of fresh incitations to the muscles, during the performance of successive movements—for example, when the patient was walking, a slight upsetting of the balance by a push or a stumble caused an instantaneous return of the spasm and a complete interference with progression—was characteristic of all cases of Thomsen's disease and seemed to suggest that the nervous system and not the musculature was at fault in this malady. Dr. Kinnier Wilson had examined a piece of the vastus externus excised from the younger patient and had found that the muscle-fibres were of large size, few of them being under 100 microns in diameter, and that no other abnormality was present in the sarcoplasm, nuclei, or interstitial tissue.

Dr. ADOLPHE ABRAHAMS asked if the divergence of Dr. Collier's case from the classical description of Thomsen's disease did not throw some light upon the situation of the lesion. Dr. Wilson had explained that the difficulty of the patient as a rule was that of initiating a movement, so that it was open to question whether the fault might not be regarded as inherent in the nervous system, and the sufferer regarded as possessing an abnormally long latent period. But the case seen that evening did not appear to him to display this feature, the movement started satisfactorily but failed after a few contractions.

Case for Diagnosis.

By Percy Kidd, M.D.

I. D., aged 5, at the age of 16 months had "convulsions" which lasted for twenty-four hours. Two days later he was sent to a fever hospital with swollen and congested fauces due probably to diphtheria. At that time and until the beginning of 1913 the child could walk, but suffered from recurrent attacks of malaise, in which he slept heavily and refused to eat. During the last eight months he has lost the power of standing or walking.

Russian Jew. No history or signs of syphilis; Wassermann reaction completely negative in serum and cerebrospinal fluid. Lower extremities extremely ataxic and spastic. Upper extremities apparently unaffected. Knee-jerks exaggerated; ankle clonus and extensor plantar response. No nystagmus or ocular paralysis. Pupils act well. Face, tongue, and palate move well. Skiagrams show that the sella turcica is normal. Cerebrospinal fluid contains 200 white cells per cubic millimetre.

Case for Diagnosis: Curvature and Stiffness of the Spine.

By F. J. Poynton, M.D.

S. D., female, aged 11. Admitted November 28, 1913.

History: Until eighteen months ago, the child was strong and well. She grew very fast, and nothing was noticed wrong with the child. In May, 1912, she was examined at school and was said to have spinal curvature. The child was told to lie down two hours in the day and had horizontal bar exercises. Six weeks ago the child complained of pain in the gluteal region on both sides—acute pain lasting five minutes or longer; it wakes her up at night. Rubbing seems to ease it, and the left side is the worse. The child wants to pass water when pain comes on. Pain sometimes of same nature under the shoulder-blades. Pain usually comes on at night; several attacks at night. The child has been kept in bed for the last month; pain seems worse when she is lying down. The bowels are constipated; the water is very thick sometimes. Some pain in stomach the last few days.

Past history: She had measles seven years ago slightly, whooping cough five years ago, and mumps six years ago; all slightly. No other illness. The child used to stumble easily.

Family history: Parents healthy; no illness in the families. Three other children healthy.

Condition on admission: The child is big for her age, and well nourished; rather sallow complexion. Back: There is a well-marked kyphosis in the dorsal region, with a corresponding lordosis in the lumbar region. There is also a lateral curvature, convex towards the right, in the lower dorsal region. The left side of the chest is prominent; there is no projection of the spine. No tenderness. Marked stiffness in the back. The child is unable to bend down and touch her toes. There is some pain on movement; free movement at the hips. Nervous system: Eyes—pupils react to light and on accommodation; *? slight nystagmus* on looking to the left. Fundi normal. Cranial nerves normal. Organic reflexes normal. Superficial reflexes: Abdominal absent; plantar not obtained. Deep reflexes: Knee-jerks and Achilles-jerks absent. There is *no anæsthesia*, but there is a *slow response* to stimulus in the lower limbs. The walk is unsteady and slow; the back is kept fixed. *There is a slight degree of pes cavus.* There is some unsteadiness on standing with feet together and eyes closed. The circulatory, respiratory, alimentary and urinary systems show nothing abnormal.

Since admission to hospital the child has had several attacks of pain in the gluteal region at night. These have been relieved by aspirin.

Case of Pseudo-hypertrophic Dystrophy presenting some Unusual Features.

By F. M. R. WALSHE, M.D.

THE patient is a boy, aged 20. He gives the following history: He was perfectly well in every respect until four years ago, with the single exception that he was unable to run as long or as fast as other boys of his age. Until he was aged 16 he played football, and although not a fast player was regarded as a powerful kicker. Four years ago he first noticed some difficulty in walking upstairs, and when drilling he was no longer able to rise from the squatting position. These disabilities have slowly increased since. He walks well on the level. He has not noticed any weakness of the upper limbs. His calves have been enormous for as long as he can remember. He is not aware of any recent changes in the size of his muscles.

One maternal uncle attended the out-patient department at Queen Square in 1902 and was seen by Dr. Batten, who regarded the case as a myopathy of the pseudo-hypertrophic type. The family history is otherwise negative.

The boy is in general well developed with musculature of good size. He presents, however, considerable enlargement of all muscles below the knee. In the thighs the vasti are atrophic, but the other muscles all show undue bulkiness. There is weakness of hip and knee movements, but the muscles of the leg are not weak. Trunk muscles are normal in contour and power. There is no lordosis. The upper limbs are well developed but not unduly large. The deltoids show no definite wasting or weakness. The pectorals show definite loss of substance at their lower borders. The serratus magnus also is relatively small and poorly developed on both sides. The rhomboids and latissimus dorsi are normal. Infraspinatus is somewhat bulky. There is definite weakness of the lower fibres of the trapezius, most pronounced on the left side and allowing displacement of the scapula on forcible adduction of the abducted arm. He walks well on the level, but on going upstairs or on rising from the ground his movements suggest those seen in typical cases of pseudo-hypertrophic dystrophy, but there is relatively slight disability. All the tendon-jerks are normal with the exception of the knee-jerks, which are practically absent. The superficial reflexes are normal.

Neurological Section.

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Mr. WILLIAM THORBURN, President of the Section, in the Chair.

The Pathology of Pellagra.

By S. A. KINNIER WILSON, M.D.

THIS preliminary paper is based on the pathological examination of thirteen cases of pellagra. Of these, the material from nine cases of pellagra in Nyasaland was very kindly sent to me by my friend Dr. Hugh S. Stannus, Medical Officer at Zomba, Nyasaland, to whom I am under the deepest obligation in the matter. The four other cases are English; three of the patients died at the Middlesex County Asylum at Napsbury, the other at the Holloway Sanatorium, Virginia Water. I wish here to express my indebtedness for this material to Dr. L. W. Rolleston, Superintendent of Napsbury Asylum, and to Dr. W. D. Moore, Superintendent of Holloway Sanatorium, as well as to Dr. G. S. Blandy, of Napsbury, and Dr. E. M. Johnstone, of Holloway Sanatorium, who have already published the clinical records of these English cases.

At the State prison at Zomba in Nyasaland there has been a severe outbreak of pellagra, some 120 or more cases having occurred within the last two or three years, and Dr. Stannus, who has already made a pioneer contribution to the study of that disease in Central Africa, will shortly publish a full and exhaustive account of the affection as it occurs in that part of the world.

The material from the Nyasaland cases, therefore, is derived mostly from severe types of pellagra; the English material, perhaps, has not been always quite so typical, nevertheless, authorities such as Dr. Sambon have put their imprimatur on the genuineness of the cases, clinically considered, and we shall see that from the pathological viewpoint the English and the African cases are identical.

In this preliminary communication I do not propose to take up time by discussing at length previous contributions to the pathology of pellagra. A great deal of work has been done on the subject, but a careful scrutiny of the literature shows that unanimity is far from having been attained as to the exact nature of the pathological processes in the disease. I may simply mention here, by way of reference, the contributions of Belmondo (1890), Tuczek (1893), Marie (1894), Lombroso (1898), Tabés and Sion (1898), Righetti (1899), Carmao (1902), Gregor (1906), Kozowski (1912), Mott (1913), Mario Zalla (1913), Singer and Pollock (1913), and there have been many others whose work it has been desirable to consult.

The questions which face the pathologist after due investigation of his material may be expressed somewhat as follows: Is pellagra pathologically a disease *sui generis*, or is it not? If it is, what are its characteristics? Is it a systematized or a generalized—i.e., diffuse—pathological condition? Is it an infection or an intoxication, or possibly both? And is it produced by more than one agent? We shall return to these questions at the close of this communication.

With the material at my disposal an exhaustive examination has been made of almost every organ in the body. The thoracic and abdominal viscera, lymph glands, ductless glands, and skin have been carefully studied. The brain, cord, membranes, anterior and posterior roots, peripheral nerves and muscles, and the sympathetic system have all been investigated. It has seemed to me best to discuss the changes in the nervous system first, as there is more dispute about their nature and significance than about the findings in the other systems of the body.

PERIPHERAL NERVOUS SYSTEM.

Muscles.—As a rule, the alterations in the muscles are slight and of secondary importance, consisting in increase of sarcolemmal nuclei, and rounding off of the muscle-fibres, which may lose their polygonal or polyangular contour. Slight secondary interstitial changes may follow any early atrophy of muscle-fibres from diseases of the anterior horn cells or peripheral nerves. The cross-striation of the fibres is well preserved. I have seen no signs of primary disease of the parenchyma, and no evidence of inflammatory myositic change. There are no collections of round cells in the muscles.

Peripheral Nerves.—Changes in the peripheral nerves are practically constant, and considerable importance must be attributed to them. They are often very advanced. The nerves investigated have been the sciatic and the popliteals in the lower extremities, the median and ulnar in the upper.

(1) With the method of Weigert or of Weigert-Pal for myelinated fibres it is extremely common to find degeneration of the myelin sheaths, usually occurring in a scattered and irregular fashion. It is comparatively rare to find complete fragmentation and disintegration of the sheaths as in Wallerian degeneration; but what one usually sees is partial fragmentation. There is very commonly a kind of honeycombing of the myelin, which is often swollen and thinned. Further, it is often imbricated in varying degree. This sometimes consists merely in splitting of the outer layer of the myelin, but it sometimes advances to an extraordinary extent, there being little, if any, actual interruption of continuity of the myelin, till the nerves look as though they were constituted by long rows of conical myelin fragments, each fitting into the next in a curiously symmetrical fashion.

(2) By Marchi's method for degenerated myelin it is not very common, except in advanced cases, to find typical Wallerian degeneration, but, on the other hand, there are constant diffuse irregular changes, consisting in small collections of lipoid substances, fragments or flakes of myelin, sometimes small round particles of myelin, either inside the neurilemmal sheath or in cells of the endoneurium. It is also common to see degenerated myelin sheaths which have not disintegrated or become discontinuous, but which nevertheless stain with osmic acid (Bandstreifen).

The alterations in the peripheral nerves, from the point of view of degeneration of the sheaths, are more marked in the lower than in the upper extremities.

(3) By Bielschowsky's method for axis cylinders it is only in advanced cases that much or any recognizable involvement of the axons has been noted. In one case they were certainly fragmented, irregularly thickened and thinned, always in an unsystematized and diffuse manner.

(4) By tissue stains such as hæmatoxylin-eosin and hæmatoxylin-van Gieson several of the sciatic nerves show definite œdema of the

nerve-fibres and nerve-bundles; the latter are often separated from the perineurium by comparatively wide spaces. A degree of interstitial change, a thickening of the perineurium and epineurium, is also common. The vessels of the perineurium are sometimes seen to show œdema of their endothelium, but I have not noted any hyaline degeneration.

Stained in this way, none of the nerves examined have been found to be the seat of small round cell infiltration, either in the neighbourhood of the blood-vessels or irregularly scattered through the nerve tissues. On the other hand, it is not uncommon to remark the presence of compound granular corpuscles or "Körnchenzellen" round the capillaries of the perineurium, easily recognizable also by Marchi's method or with Sudan III.

(5) One of the most remarkable features of the peripheral nerves in pellagra can be studied only by staining the nerves with thionin blue or toluidin blue. In this way it is possible to detect the π-granules of Reich, to the examination of which much of my attention has been devoted.

The π-granules of Reich are collections of minute granules or flakes, all small, but presenting not a little variety of shape, which stain a brilliant violet-red, metachromatically, with thionin blue. According to the researches of Reich and of Doinikow, they are normally present in the peripheral nerves of man from about the age of 6 onward, though in small amount; they are increased in old age, when presumably some degenerative change in the nerves is setting in. In the normal peripheral nerve they are found arranged in more or less wedge-shaped masses in the cytoplasm of cells which appear to belong to the sheath of Schwann, always with a perinuclear distribution, as though caught in a perinuclear meshwork. According to Reich they consist of protagon, which is a substance related both to cholin and to lecithin. The most recent views on protagon throw doubt on its unity; it is probably a mixture of phosphorus-free and phosphorus-holding lipoids. Alzheimer is of the opinion that the granules represent mixed products of metabolism; he has seen them also as minute points or deposits in glial cells and in the adventitia of vessels. Doinikow agrees that they are found in small quantity, occasionally, in the cells of the endo- and peri-neurium, and in the perivascular lymphatics of the endoneurium. While, therefore, the π-granules are not specific for the cells of the sheath of Schwann, it is there that they are found *par excellence*. It is worth noting that the Schwann cells, biologically considered, resemble the glial cells in the central nervous system; they give over products of metabolism to the cells of the mesoderm.

It is quite justifiable to conclude that the π-granules are *special* products of the metabolism of myelin, and their presence may be taken as an index of myelin metabolism. It must be remembered that they do not stain with osmic acid, and are entirely distinct from the ordinary fatty granules seen in Wallerian degeneration. Of their pathology extremely little is known. Apparently this has not been investigated by any one. Doinikow has the briefest reference to their occurrence in cerebrospinal syphilis, where they are found to be increased.

In pellagra I have found that they are very greatly increased in amount, and in two ways. There is firstly, as compared with normal nerves, a considerable increase in the number of cells containing the granules. It should be remarked here that in a normal nerve only a few, relatively speaking, of the Schwann cells contain them at all. But, secondly, where the myelin is degenerating in the way already described, immense quantities of these granules are to be found, lying in the meshes of the honeycombed and imbricated myelin in the neuro-keratin network, altogether away from the Schwann cells. The picture presented is very striking.

In all the sciatics of pellagrins which I have examined they have been present in great abundance; where the degeneration has been advanced their quantity has been a maximum. Their occurrence in such quantity may be taken, in my opinion, to be a definite indication of an abnormal metabolic and toxic change in the peripheral nerves. In some cases they are seen to be present in cells which have reached the perivascular lymphatics of minute vessels in the peri- or endo-neurium. These cells have the general appearance of Körnchenzellen. It is distinctly doubtful whether the cells with the π-granules are really cells of the sheath of Schwann; their large pale nucleus is very different from the elongated darker nucleus of the Schwann cells proper. Just as I was finishing this paper the recent brochure of Mario Zalla has come into my hands; as far as I am aware, he is the only other author who has dealt with this question, and he reports that he has found the π-granules in quantity in the peripheral nerves of pellagra.

Other cells have been noted in quantity in my cases of pellagra; these are the "Mastzellen" of Ehrlich, which are present in considerable numbers in the perineurium. They have been described in various forms of polyneuritis, and their occurrence in pellagra may be taken as a further indication of an abnormal condition of the peripheral nervous system and as a reaction to a toxic invasion.

In pellagra, then, it may be taken there is evidence of parenchymatous and interstitial changes in the peripheral nervous system, a reaction to a toxic invasion.

SPINAL CORD AND MEMBRANES.

Anterior and Posterior Roots.—These structures were examined by all the methods already enumerated for the peripheral nerves. To take the posterior roots first. In them the same changes are found as in the sciatic nerves. There is a diffuse degeneration, both parenchymatous and interstitial. The myelin sheaths show alterations of the type already specified; the axis cylinders are comparatively intact. The interstitial tissues are often slightly thickened. The π-granules of Reich are present in large quantity, both in the sheath cells and where the myelin is degenerating. Œdema of the nerves of the posterior roots is frequently noticed. The changes in the anterior roots are very much less marked; in many of my cases the roots were to all intents and purposes normal. In more than one case œdema of the intramedullary portion of the anterior roots was noted. The vessels of the roots do not show any special changes; compound granular corpuscles may occur in small amount in the adventitial lymphatics, but there are no small round cell collections.

Spinal Membranes.—Any alterations in the meninges are comparatively insignificant. A degree of leptomeningitis may occur, especially over the posterior aspect of the cord. In the meninges and in the neighbourhood of their vessels I have failed to discover any plasma cells or any lymphocytic infiltrations.

Posterior Root Ganglia.—In preparations stained by Nissl's method it is common to find that many of the cells of the posterior root ganglia are in a condition of subacute degeneration, with excentricity of the nuclei, central chromatolysis, often with pigmentary degeneration. Some cells are swollen; others are rather atrophied. The picture is that of an essentially diffuse and irregular pathological process. There is not infrequently a degree of interstitial change. There is no indication of an inflammatory reaction.

Spinal Cord : Cells.—The most marked changes are undoubtedly to be seen in the cells of Clarke's column. Here all stages of chromatolysis are met with. As a rule there is a typical subacute cell degeneration, with perinuclear chromatolysis, displacement of the nucleus, swelling of the contours of the cell, and so on, passing eventually into a pigmentary degeneration and atrophy. In many sections it was not possible to find a single normal cell in Clarke's column. It is, of course, known that occasionally such cell changes occur in Clarke's columns in apparently normal cords; but where every cell, over numbers of sections, is affected, the condition must certainly be regarded as pathological. The cells of the intermedio-lateral tract often show some diffuse degeneration and atrophy, a point of some importance. The anterior horn cells are often affected, but not constantly so. Normal cells may be detected side by side with others in which chromatolysis is occurring. There is a tendency for these anterior cornual cells to show rather a chronic type of degeneration—i.e., gradual shrinkage and atrophy, .in preference to more acute changes. The latter, however, certainly do sometimes occur.

Fibres.—(1) With the methods for myelinated fibres, it may be remarked at once that the lesions in the white matter are more noticeable in the posterior columns than elsewhere. There is a varying degree, according to the severity of the case, of degeneration in the columns of Goll and of Burdach; the former are almost always affected, the latter not so often. The change is essentially diffuse; in the lumbar and dorsal cord this can be readily determined; in the cervical region there may appear to be a more definite tract degeneration, but this is mainly because by the time the cervical cord is reached the long ascending fibres have come closely together. A comparison of a number of pellagrous cords in my series shows that in no two are the posterior cord lesions absolutely identical. It is very common to find that the degeneration commences away from the periphery of the tracts of Goll, the posterior strip of the posterior columns being left intact. Sometimes the cornu-commissural tract of Marie escapes, sometimes it does not. Sometimes the lesions are very slight. Degenerations in the lateral columns are, in my experience, less obvious; but they may be present, and they are not confined to the exact area of the pyramidal or any other tract system. The spino-cerebellar paths may show a diffuse and scattered degeneration, again not one that is strictly confined to their area. The root entry zones are very commonly involved.

It may be definitely said, therefore, that the cord lesions are pseudo-systematized. They are seen mainly in the posterior and lateral columns, hence the condition resembles a combined sclerosis; on the other hand, they are not confined to anatomical paths; in other words, there is no systematized tract degeneration.

(2) This view of the nature of the cord affection is amply borne out by a histological examination with tissue stains. In the lateral and posterior columns, but especially in the latter, are large quantities of corpora amylacea, irregularly scattered through the tissues. Œdema of the nerve-fibres and tissue spaces is frequently seen. Here and there little separate groups of fibres are degenerated, and their place is being taken by glial overgrowth. All the cases I have had the opportunity of examining are characterized by the presence of large numbers of compound granular corpuscles, or Körnchenzellen, which are found either irregularly scattered through the posterior columns or massed in the lymphatics of the adventitia of the spinal vessels—mainly the veins, be it noted. They are more abundant in the posterior columns than anywhere else, and certainly more in the posterior than in the anterior half of the cord. There is a noteworthy absence of any lymphocytic or plasma cell infiltrations in the neighbourhood of the vessels or elsewhere. These may be said, in fact, to be conspicuous by their absence.

In one or two cases, in addition to the Körnchenzellen, I have noted the presence of amœboid glial cells such as have been described by Alzheimer. These cells have been seen in the immediate vicinity of blood-vessels of the posterior columns, and their cytoplasm has contained minute fatty points staining with osmic acid.

(3) With Marchi's method it is a simple matter to convince oneself that the cord lesions of pellagra are essentially unsystematized; there is often a marginal degeneration of the cord, and degenerating fibres are found indiscriminately over the whole transverse section; endogenous and exogenous fibres alike may degenerate; the lesions, as already noted, are at their maximum in the posterior columns and in the dorsal segments. As the case advances, glial sclerosis takes the place of the diseased parenchyma; it can thus be understood that in any given case the pathological picture may vary within somewhat wide limits.

Regarded from the histological view-point, the condition of the cord in pellagra bears a strongly marked resemblance to that in subacute combined degeneration, which is a very fatal nervous disease often associated with profound anæmia. The myelin disintegration, diffuse and unsystematized, and the presence of compound granular corpuscles, together with the absence of inflammatory reaction round the vessels, are identical in the two diseases. The pathological process seems the same; under a high power, with either tissue or Marchi stain, it is practically impossible to draw any distinction between the two conditions.

As a rule, in pellagra the main cord lesions are more likely to be confined to the posterior columns than in subacute combined.

Thus, with a low power, Weigert-Pal pictures of pellagra present a spurious resemblance to tabes; with a high power the process is seen to be essentially a different one; plasma cells, lymphocytic infiltrations, and meningeal reactions distinguish the latter.

Medulla, Pons, Cerebellum and Cerebrum.

It will not be necessary to enter here into any minute description of the changes found in the rest of the central nervous system. There is always evidence of a subacute or chronic toxæmia at work in the alterations produced in the nerve cells, whether they be cells from the cranial nerve nuclei, or Purkinje cells in the cerebellum, or pyramidal or Betz cells of the cortex. In no one of my cases have I seen any small cell infiltrations or inflammatory reactions in the membranes and cortex. Plasma cells and lymphocytes are not found; compound granular corpuscles are not infrequently seen in severe cases. Any meningeal change consists in a slight arachnitis.

Other Systems.

Due reference will be made in a more detailed publication to the visceral changes which characterize pellagra. It will suffice for the present to say that I have noted in the viscera of thorax and abdomen the changes that have often been studied before; hyperæmias and hæmorrhages, fatty degeneration and atrophy, inflammation and ulceration of the alimentary tract, atrophy and pigmentation of the liver, atrophic secondary changes in spleen, kidneys, and so on; in the skin, hyperæmia, serous transudation, changes in the Malpighian layer, epithelial thickening and pigmentary deposit, &c. All the ductless glands have been examined, with the finding of similar general changes.

If now we sum up briefly the pathological evidence here advanced from a study of thirteen cases of pellagra, the following statements may be made, so far as the nervous system, peripheral and central, is concerned. There is abundant pathological evidence of a widespread, generalized toxæmia of the peripheral and central nervous system. In the present series there is no unequivocal evidence of a vascular or meningeal reaction to an infection. Pellagra is readily distinguishable from the trypanosome diseases. The histological changes are not those of an infection by blood- or lymph-stream. It is difficult to say when a toxæmia of the peripheral nerves becomes a true neuritis, but in some cases at least parenchymatous and interstitial neuritis occurs. There are always signs of a peripheral nerve reaction to a toxic invasion, but it is not easy to determine whether the peripheral nerve changes accompany, precede, or succeed the changes in the cord. It is probable, in my opinion, that an ascending toxic lymph-stream invades the cord via the lumbar and dorsal posterior roots, and that the effects of the toxæmia appear either simultaneously in the nerves and cord, or previously in the former. It has often been suggested that the toxin is of alimentary origin, and the most recent work of Orr and Rows would seem to suggest that the histological appearances in the cord in pellagra bear out the probability of the toxin coming from the abdominal cavity. There is, however, no pathological evidence to negative the possibility of the toxin assumed being derived from an alimentary infection.

In answer to the questions propounded at the outset, then, it may at present be tentatively concluded that there is no single pathological feature of itself pathognomonic of pellagra, while a comprehensive survey of the widespread lesions would probably enable the investigator to reach a correct diagnosis.

The pathological process which underlies pellagra is essentially diffuse and unsystematized.

A consideration of the histological data already described suggests that the morbid agent is not a virus, but a toxin, as far as the nervous system is concerned. It would be unwise, however, to make this conclusion definite at present, and it is well to remember that, as Mott has already reminded us, in malaria a blood infection occurs without any histological evidence of vascular reaction.

DISCUSSION.

Dr. F. PARKES WEBER asked if there were any reliable observations as to the changes in the spinal cord in cases of chronic *ergotism* in man, or in experimental chronic ergotism in animals. It would be interesting to be able to compare such changes with those described by Dr. Wilson in pellagra cases. Dr. Wilson said that the changes he had found were such as might be of toxic origin. He (Dr. Weber) supposed that under so-called chronic "toxic" causes of disease Dr. Wilson would include not only the chronic *intake* of toxins with the food (or their production in the alimentary canal or elsewhere in the body), but also the disorders of nutrition dependent on the chronic *absence* of "vitamines" from the food.

Dr. KINNIER WILSON, in reply, explained the difference between the granules of the Mastzellen and the π-granules. He had not found transitional forms between these. He described the histological nature and characteristic reactions of the Körnchenzellen. He agreed that lateral column changes had been described in other cases as being well marked, and he was somewhat surprised to find so little, comparatively speaking, in his own cases.

Further Note on a Case of Hysterical Brachial Monoplegia following Electric Shock.

By PURVES STEWART, M.D.

THIS patient, who was shown at a previous meeting of the Section on December 11, 1913,[1] was re-exhibited at the meeting to demonstrate complete disappearance of all sensory and motor symptoms.

The further history of the case was interesting. He was treated in hospital for two and a half months by various forms of electricity and numerous psychical and sensory stimuli, but without success. On the contrary, the total flaccid paralysis of the left upper limb persisted and the anæsthesia advanced proximally on the trunk so as to include the outer part of the pectoral region in front and of the scapular region behind. Suggestive treatment by attempted hypnosis was assiduously carried out for a number of weeks by a medical colleague who devotes himself entirely to psycho-therapeutics. No improvement having resulted after two and a half months' hospital treatment, it was decided, before discharging the patient, to try the effect of administering a general anæsthetic, in the hope of loosening the hysterical obsession during the stage of delirium preceding general anæsthesia. Accordingly the patient was placed on a couch with the healthy right arm fixed to his trunk by means of a bandage. Ether and nitrous oxide were then administered, freely mixed with air. Within a few moments the patient began to make purposive movements with the "paralysed" left arm and these soon amounted to violent fighting movements, in which he endeavoured to tear away the anæsthesia mask from his face. Whilst the patient was in this excited condition numerous suggestions were made to him that he should move his paralysed arm in various directions, these suggestions being accompanied by various painful stimuli—e.g., twisting the ear, pressing the supra-orbital notch, &c. During this stage it was also suggested that his unaffected right arm should become temporarily analgesic to pin-pricks, and this duly occurred. It was then suggested to him that all his sensory and motor symptoms should disappear. On recovering from the effects of the anæsthetic patient had lost his previous anæthesia and was able to move both upper limbs in a normal fashion. He has since remained well. The paralysis of the left upper limb had lasted over eleven months from the time of the original electric shock.

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[1] See *Proceedings*, p. 24.

Neurological Section.

March 26, 1914.

Mr. WILLIAM THORBURN, President of the Section, in the Chair.

Toxi-infection of the Central Nervous System.

By D. ORR, M.D., and R. G. ROWS, M.D.

FOR years it has been apparent that continued examination of chronic lesions in the spinal cord, while increasing our knowledge in detail yet failed to widen it in regard to ætiology, and though toxic influence naturally received due recognition, its source and mechanism of action remained unexplained. It seemed obvious, therefore, that investigation ought to be directed towards elucidating the mechanism of production of those lesions, and the first step naturally involved a study of all possible paths of infection and intoxication. It is with one of those, infection via the lymphatic system of peripheral nerves, that our demonstration mainly deals, and in it we propose to synopsize our observations in clinical cases and experiment. Much of the detail on which our conclusions have been founded must necessarily be omitted. It will be found in a paper to be published shortly.

The lymph system of nerves has been investigated mainly by the injection of coloured substances—e.g., china ink—and of organisms. Homén, employing organisms, has shown that the lymph-stream is an ascending one towards the cord, and his view is that the main current lies at the periphery of the nerve-bundles immediately under the fibrous sheath. He has traced the organisms up the nerves, along the inner surface of the posterior root ganglia and perineurium of the spinal roots into the pia-arachnoid of the cord. It must be borne in mind, however, that this statement regarding the main lymph current is based on experiments in which organisms have been injected into the nerve substance. Where infection occurs from without it will be shown that diffusion of organisms and toxins can take place along the outer surface of nerves, and cause an ascending epi- and peri-neuritis.

The Evidence derived from Clinical Material of Infection of the Central Nervous System by Toxic Diffusion along the Perineural Lymph System.

We examined seventeen cases, some of which were investigated by Marchi's method, others by appropriate means for the demonstration of the inflammatory phenomena. We will refer here briefly to three only.

Case I.—Left brachial neuritis. Staphylococcic infection around the cords of the plexus and posterior root ganglia. No degeneration in the extra-medullary portion of the anterior or posterior spinal roots. Marked degeneration of the left root entry zone and Burdach's column from C_8 to C_2; maximum in C_7 and C_6; degeneration also present in the lateral region and anterior radicular fibres; right side of cord affected similarly but to a much less extent.

Case II.—Bed-sores in gluteal region; more severe on the left side. Suppuration of right elbow-joint. There was degeneration of the posterior columns and of the anterior radicular fibres in the lumbo-sacral region from S_1 to L_3, more intense on the left side and in the fourth lumbar segment; from D_{12} to D_2 nothing worthy of note; degeneration commenced again in the posterior columns of D_1, was most marked in C_7 and C_6, and gradually faded above that level. The right root entry zone was more affected than the left.

Case III.—Acute hæmorrhagic ulceration of the colon, especially in its lower portion. Acute cystitis. Acute suppuration of the right knee-joint. Cultures from the cerebrospinal fluid yielded an active growth of a rod-shaped bacillus. On examining the lumbar region of the cord we found organisms in abundance in the following regions: in the internal layers of the perineural sheath of the posterior and anterior spinal roots, amongst the fibres of the posterior root entry zone, in the pial spaces round the cord margin, in the septa passing into the cord, amongst the motor fibres in their intramedullary course, and in the central canal and its neighbourhood. In the spinal roots the organisms were observed passing inwards along the septa. Many were present in the adventitial lymph spaces of both cord and roots, but none within the lumen of the vessels. In this case the organisms invaded those areas which are affected in toxic diffusion. It will be remembered that in the case of brachial neuritis the myelin degeneration occurred in the posterior root entry zone, the anterior radicular zone, under the pia arachnoid, and around the septa in the white matter.

From our clinical cases we concluded: (1) That the lesion in the spinal cord always corresponds to the nerve supply of the infective focus. (2) That the degeneration of the intramedullary portion of the spinal roots commences at the point where the neurilemma sheath is lost. (3) That the posterior root entry zone is always most affected. (4) That as examination of the extramedullary portion of the nerves yielded a negative result, it seemed correct to assume that toxins could, in certain cases, ascend along the perineural lymphatics without producing parenchymatous changes in the nerves.

EVIDENCE OF LYMPHOGENOUS INFECTION OF THE CENTRAL NERVOUS SYSTEM FROM EXPERIMENT.

(*A*) *Degenerative Lesions.*—We proceeded to test the above views by experiment, and instead of injecting organisms or toxins into nerves we placed a celloidin capsule containing a broth culture of an organism in contact with the nerve. In some cases the capsule was placed against the sciatic nerve, in others under the skin of the cheek. In our early experiments we employed a variety of organisms; later we used the *Staphylococcus pyogenes aureus* alone. The experiments were carried out on rabbits and dogs. By this means we infected the lymph system of nerves, and produced degenerative lesions not only in the cord but in the medulla and pons, precisely similar to those found in our clinical cases. We again found the extramedullary portion of the nerves free from degeneration. From the clinical and experimental evidence we concluded that (1) in spinal and cranial nerves there is an ascending lymph-stream to the central nervous system, whose main current lies in the spaces of the perineural sheath: toxins reach the central axis by this channel; (2) outside the central axis the nerves possibly are protected by the vital action of their neurilemma sheath; most probably, however, it is the peripheral situation of the main lymph current which is the deciding factor.

(*B*) *Histological Lesions.*—We will now bring forward the histological evidence in support of the above statements. If a capsule containing a broth culture of the *Staphylococcus pyogenes aureus* be placed in contact with the sciatic nerve inflammatory phenomena can be traced upwards to the posterior root ganglion and beyond it into the spinal roots. The toxins induce inflammation of the fixed tissues—e.g., the epineurium, the perineurium, the adventitial coat of the veins and capillaries outside and inside the nerve. The reaction diminishes in severity immediately the neighbourhood of the capsule is left. Taking the capsule as the centre of the inflammatory focus and proceeding outwards one finds: (1) A layer of degenerate polymorphonuclears mixed with large clear cells. (2) Developing and adult fibroblasts mixed with large clear cells. (3) In the epineurium, new vessel formation, clear proliferated adventitial nuclei, round dark nuclei, and plasma cells in all stages of development. (4) In the inner layers of the perineurium, within the nerve, and 1 in. above the capsule there is much less reaction, and plasma cell formation is the most prominent feature. This statement also holds good for the spinal ganglia and roots. Should suppuration occur, then fibroblast and new vessel formation are much more prominent.

In a certain number of experiments the capsule was placed as near to the spinal cord as possible in order to induce myelitic phenomena. When the spinal canal is opened into and a capsule fixed in position against the dura mater the *subacute* reaction changes are as follows: (1) In the epidural tissue, polymorphonuclear leucocytes, plasma cells, and mononuclear elements resembling those termed polyblasts. (2) Plasma cells in the dura mater; in the capsule of the posterior root ganglion, and within it, where they form a prominent group at the proximal pole; in the perineurium of the spinal roots, and in the adventitial sheath of their vessels; in the pia arachnoid and in the adventitial sheath of the vessels passing into the cord. (3) Proliferation of the neuroglia cells, especially around the vessels.

In some experiments the capsule placed against an intervertebral foramen ruptured and the organisms escaped into the surrounding tissues. Here the inflammatory reaction was much more acute, and the organisms were followed along the nerves, over the spinal ganglia, on to the dura. The reaction phenomena in the cord were identical with those found in an *acute* meningo-myelitis. There was a high degree of reaction on the part of the dural, pial, and adventitial cells. The neuroglia cells, especially round the vessels, were swollen and identical with the "amœboid" type of Alzheimer. The nerve cells were acutely degenerated. Coagulation necrosis of the cytoplasm, with homogeneous atrophy of the nucleus, was common, and neuronophagy. By Marchi's method there was much myelin degeneration, in the lateral columns especially. On comparing the phenomena in the acute and subacute series we found that although they differed in degree their anatomical distribution was the same.

From the histological evidence there remains no room for doubt that the lymph-stream in nerves is an ascending one, and that toxins and organisms can be carried to the central axis by that path. They pass with the lymph into the root entry zones, round the cord margin in the spaces of the pia arachnoid, and along its prolongations into more central parts. The proliferative changes in connexion with the vessel adventitia show that its spaces communicate with the lymphatic system of the cord and nerves.

So far, we have dealt solely with the morbid phenomena of lymphogenous infection; we propose now to contrast these, in the briefest possible manner, with the changes found in the cord when the blood-stream is infected. A hæmatogenous lesion is obtained in the spinal cord when capsules containing the *Staphylococcus pyogenes aureus* are placed in the abdominal cavity.

The difference between the two varieties of infection is very marked. In lymphogenous infection we find: (1) The reaction of the cells of the fixed connective tissues; (2) proliferation of the cells of the adventitial sheath of the veins and capillaries; (3) the appearance of scavenger cells where the myelin is disintegrated; (4) nerve cell degeneration and neuronophage phenomena. In hæmatogenous intoxication the picture is very different: (1) The most highly developed structures, the nerve cells, suffer least of all; (2) there is primary degeneration of the myelin sheath round the cord margin, and on either side of the postero-median septum; (3) the myelin degeneration is greatest in the upper part of the cord; (4) there is œdema of the cord; (5) the vessel walls are hyaline and contain thrombi of the same nature.

These two mechanisms of infection of the cerebrospinal system are characterized, therefore, by widely different morbid phenomena, and if we apply the results of the experiments to the human subject we obtain very considerable assistance in arriving at an understanding of the genesis of certain lesions. We have shown in a previous publication that many cases of acute and subacute meningo-myelitis are lymphogenous inflammations following infection along the peripheral nerves; and by certain authorities even acute polio-myelitis is now defined as an acute meningo-myelo-encephalitis, in all probability the result of infection from the same source or the sympathetic nerves.

We have already offered the opinion that tabes dorsalis and general paralysis of the insane are lymphogenous infections; the distribution of the former and the histological characters of both are similar to those produced by infection of the lymph-stream of nerves.

A consideration of the phenomena in the subacute non-systemic lesions of the cord such as occur in pernicious anæmia, Addison's disease, &c., shows that they must be included in the hæmatogenous category. They are degenerative, and the zones affected and type of morbid change correspond with those found in experimental hæmatogenous intoxication.

In conclusion, we would point out that our work upon hæmatogenous intoxication is still in the preliminary stage. There are certain factors still under consideration. We have brought it forward now, however, as the results so far seem to justify a broad distinction being drawn between the two mechanisms of toxi-infection of the central nervous system—the lymphogenous and the hæmatogenous.

DISCUSSION.

Dr. HARRY CAMPBELL asked whether the lymph currents, reaching the spinal cord by the nerve-roots, diffused themselves generally throughout the lymph spaces of the cord, or whether they travelled along special routes; also what became of the lymph of the central nervous system. Referring to the circulation of the cerebrospinal fluid, he pointed out that this fluid not only escaped peripherally along the nerve-sheaths, but (as shown by Dr. Golla) that it also soaked into the peri-neuronic spaces of the central nervous system along the perivascular lymph spaces. Hence drugs might be introduced into the central nervous system via the subarachnoid space. This was a fact of therapeutic importance, since the capillaries of the central nervous system were impervious to spirillicidal drugs, such as compounds of mercury and arsenic.

Dr. ORR, in reply, briefly indicated the evidence which showed that the lymph-stream in nerves was an ascending one. In reply to Dr. Harry Campbell's questions regarding the presence of lymphatics in the central axis, Dr. Orr pointed out the evidence to show the presence of fine vessels within the nerve cells, probably in communication with the vascular system; that there were no true lymphatics in the cord, the lymph circulating free amongst fibres and cells, and that the lymph regained the general circulation via the veins and capillaries.

Neurological Section.

May 21, 1914.

Mr. William Thorburn, President of the Section, in the Chair.

Carbon Monoxide Poisoning in the Senghenydd Explosion.

By Ivor J. Davies, M.D.

The Senghenydd Explosion happened about 8.10 a.m. on October 14, 1913, and is the worst disaster in the history of British mining. The number of men killed was 440. The whole of the men working on the eastern side of the mine were brought up safely, almost immediately after the explosion occurred ; eighteen men only were rescued from the western side, after an exposure to the noxious fumes for twenty hours, and survived. Five died from the effects of burns and injuries sustained whilst following their occupation in close proximity to the shaft, and one man lost his life on the day following the explosion whilst assisting in work at the fire which was raging in the West Main level, being killed by a fall of stone. The whole of the remaining men working on the west side were asphyxiated by carbon monoxide gas ; many were also burnt and sustained multiple injuries, either as a direct consequence of the explosive blast or from being buried under falls of roof.

Rescue of Eighteen Men from the Bottanic District.

The rescue party consisted of representatives from the various Colliery Companies, the Miners' Federation, the Home Office, and a few of the Senghenydd Colliery officials, with the Rhymney Valley Rescue Brigade in charge of Superintendent Kitto, together with Dr. Dan Thomas, of Bargoed. The circumstances under which rescue operations into the Bottanic District were rendered possible will be fully explained in a later paragraph.

The party entered the No. 1 North Road from the east side of the pit, taking fresh air with them, and found but slight evidences of force and fire along this road. Four bodies were passed; one, a man of exceptionally fine physique, was found in the middle of the road, lying on his back with both his hands clasped behind his head, indicating that he assumed a position of repose when first affected by the fumes of after-damp. There were superficial burns upon the face and hands, and well-marked signs of carbon monoxide poisoning were present. The noxious fumes in this instance must have produced a narcotic effect, for the position was one of ease, and must have been assumed before consciousness was lost.

Two other bodies were found close by, lying in a semi-prone position against a box, and leaning against each other; these also showed typical signs of asphyxia from carbon monoxide. It is interesting to note that a live horse was found on the road.

The narrow entrance to the Bottanic district was now reached, and a dead haulier was found lying doubled up over the back of a tram with his head inwards. There was an extensive scalp wound over the back of the head, and death was due to carbon monoxide poisoning. The position of the body and wound on the head suggest that he was hurled backwards against the side, struck his head, and fell forwards into the tram, and was asphyxiated whilst lying stunned in this position. A little farther in, close to the mouth of the narrow airway, was the body of the district fireman, lying in a semi-reclining position with the legs crossed, and head resting on the left hand; the body showed no marks of violence or burning, and presented well-marked signs of poisoning by carbon monoxide. The man's lamp was found some yards nearer the pit bottom in the middle of the road, indicating that after leaving his district and finding the air insupportable in the No. 1 North Road, he attempted to get back to inform his men, and when affected by the fumes dropped his lamp and tried to crawl back. As will be described later, one of the earliest signs of poisoning by carbon monoxide is that anything carried becomes too heavy, and has to be dropped.

The state of this body proves conclusively that comparatively little force entered the district, and also points to the complete absence of fire. The importance of these observations will be fully understood later in connexion with the description of the erythematous lesions found on the bodies of the survivors.

The narrow airway was now reached, and the party now proceeded in single file, but it was agreed that a line of communication should be kept from a fixed base, where some of the rescue men remained with their apparatus. The working places were now thoroughly explored in turn, most of the survivors being found along the main road. The air was fresh up to this point. Rescue Brigades from Porth and Crumlin, in charge of Superintendents Thorne and Wimborne respectively, also rendered valuable assistance in the treatment and transport of the survivors.

The following cases are typical of the series of eighteen, a clinical abstract of which is given below:—

Case I.—Aged 22. He first experienced a sensation of choking, which he attributed to smoke which entered the district, and says that ten minutes later his legs gave way and he lost the use of his feet, and was obliged to crawl on his knees to reach the main road, but before getting there "he felt his head going," and became unconscious, and recollects nothing further until the evening of the following day, after admission to the temporary hospital. When rescued his condition was as follows: Unconscious, foaming at the mouth and nostrils, lying in a reclining position with his back against the coal face and head dropped forwards. Respiration was greatly laboured and frequent, the pulse was feeble, frequent and irregular, and there was evidence that he had vomited. The condition of the man was extremely grave, but he gradually revived by the treatment which will be fully described in another paragraph. He again collapsed into a similar state after being brought to the surface and carried to the temporary hospital, which had been prepared and equipped at short notice for the reception of the survivors under my care. This patient was almost *in extremis* for twenty-four hours and his condition constantly varied. His condition improved in the course of twenty-four hours, but on the following day he relapsed. For several weeks afterwards there was irregular pyrexia, varying from 99° to 101° F., and the physical signs were those of broncho-pneumonia, successive portions of the lungs becoming involved in turn. He ultimately got quite well, but the areas of skin affected by erythema remained anæsthetic for several months, and sensation is still somewhat impaired in those situations.

Case II.—Aged 19. He says that after hearing the explosion and feeling overcome by weakness he has no recollection of anything further until the fourth day afterwards, when he realized what had happened. He was found some distance from his working place and close to the main haulage road. He was badly affected by the fumes of after-damp, but to a lesser extent than his brother (Case I). The erythematous lesions were confined to his back (*see* fig. 1, p. 52). These areas of skin remained congested for several weeks and anæsthetic for several months. His general condition is now good, but he still suffers from neurasthenia.

Case IV.—He attributes the onset of symptoms to the exertion of walking quickly uphill along the incline road, for three-quarters of an hour had now elapsed from the time of the explosion. When rescued he was seen to be badly affected and more in a state of collapse than asphyxia. There was some degree of collapse, but this had greatly improved on reaching fresh air. Peripheral neuritis involved the dorsi-flexors of the right foot, giving rise to foot-drop, as shown in the photograph (fig. 2). There was also some pain, swelling and redness of the foot and leg for several days. Anæsthesia of the lower third of the outer side of the right leg and of the whole of the foot and heel was present. This afterwards cleared up upon the sole, but anæsthesia still persists in the other situations and paralysis remains almost unaltered. Some slight improvement has resulted from massage and electrical treatment of the affected muscles. There is paresis and atrophy of the whole of the right lower limb; the calf measures 2 in. less and the thigh 1 in. less respectively than the corresponding parts of the sound side. Complete reaction of degeneration is

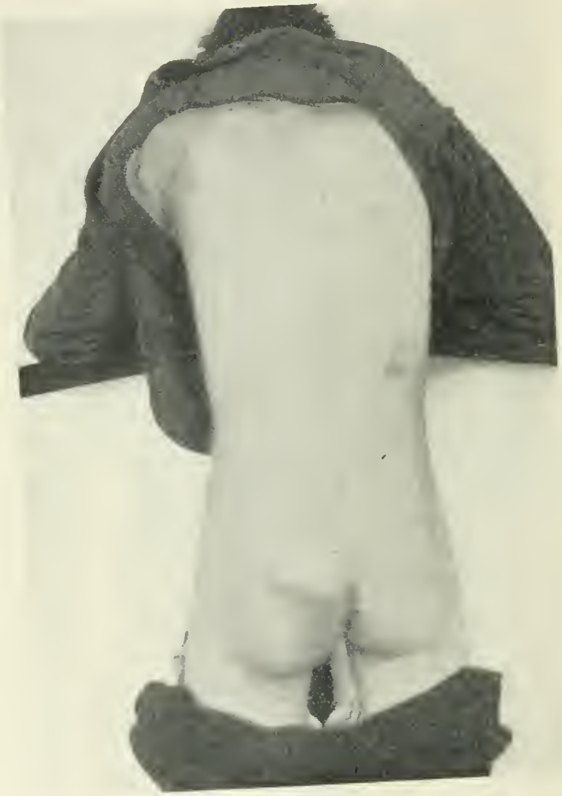

Fig. 1.

Showing disposition of erythematous lesions in Case II.

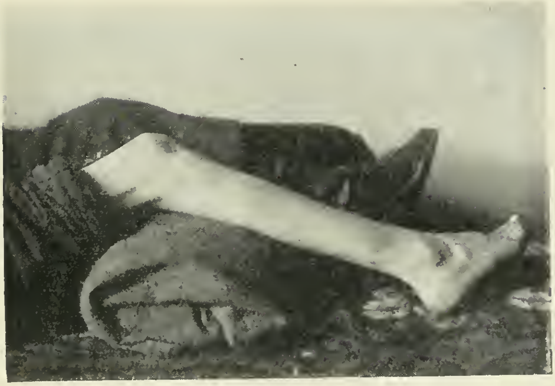

FIG. 2.

Showing effect of peripheral neuritis on foot of Case IV.

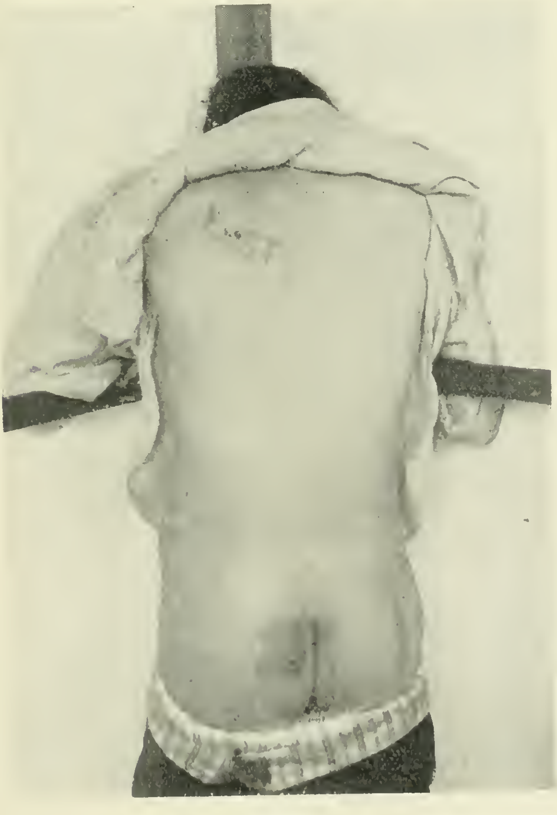

FIG. 3.

Showing disposition of erythematous lesions in Case III of series.

present in all the muscles of the right leg, except the gastrocnemius, which gives a partial R.D. The thigh muscles react normally. The erythematous lesions were identical with those described in previous cases, and in his case the lesion closely resembled an extensive wheal produced by local injury, and attended by considerable pain, swelling and induration of the part.

Taking the cases as a whole there was marked enfeeblement of cardiac action in many, and repeated attacks of cardiac failure in one case. His case (I) was considered as hopeless by most of the medical men present, but he responded well to timely stimulation and inhalation of oxygen, which was given almost continually. The condition and progress of this case have convinced the writer that no case of carbon monoxide poisoning should be regarded as hopeless, for he was almost *in extremis* when brought out of the mine and, after some improvement, following the restorative measures applied at the time of rescue, he again collapsed on reaching fresh air and during transport to the temporary hospital a quarter of a mile or so distant from the colliery.

There was acute œdema of the lungs in one case (I), three cases of bronchitis and two cases of broncho-pneumonia. Ataxy occurred in several, antecedent to loss of consciousness. Peripheral neuritis occurred in five cases. In four cases paralysis in the distribution of the external popliteal nerve resulted in foot-drop, and anæsthesia in the area supplied by this nerve. In one case (VII) the extensor muscles of the forearm were affected, resulting in wrist-drop, but this was also of short duration. The hand on this side was also in a condition of acute erythema with vesiculation, with absolute anæsthesia. This has now resulted in an atrophic condition of the whole hand, with ankylosis of the carpo-metacarpal joint of the thumb in a position of adduction, some atrophy of the thenar eminence and first dorsal interosseus muscles, and the fingers are cold, glossy and tender.

CUTANEOUS LESIONS.

Acute erythema occurred in nine of the cases. In one case (VII) œdema, vesicles and bullæ were associated with the erythema. In several œdema of the part was present with erythema. The lesions most commonly involved the buttock, and generally the skin over the tuberosity of the ischium was affected. In other situations the skin over bony prominences was most commonly affected. Thus pressure must have played a part in the determination of the site of these areas of acute erythema, for most of the survivors were found in a sitting or reclining position. However, the occurrence of acute erythema in situations other than over bony points indicates that pressure was not the cause of these lesions, and the presence of hyperæsthesia with anæsthesia, too, affords strong evidence of the existence of some other factor in the causation of the cutaneous lesions.

Characters.

The patches were raised and of a brilliant cherry-red colour, and the hair follicles stood out prominently, and the erythematous condition was attended with considerable pain, which made lying on the affected part impossible. The affected areas were hot to the touch, and very tender, and faded a little on pressure, but, owing to extreme tenderness, only slight pressure could be applied without causing much discomfort. Absolute anæsthesia was present to painful impression. This was strictly confined to these areas for the most part, but in some instances it extended a short distance beyond, but not more than to the extent of an inch in a single instance, in others it was less than this.

The colour gradually faded over a period of several weeks, and it did not go through the stages of a bruise. In two cases the areas of erythema are still evident, and the colour can be restored to some extent by rubbing the part. In one case when this is done the patch becomes red and the margins are of a purplish colour. Many show generalized vasomotor instability, and in some factitious urticaria or dermographism can easily be elicited. In one (Case VII) there is passive congestion of the fingers, which are generally cold. In some, desquamation and crusting resulted. In one (Case VII) definite scarring has taken place, and this involves the subjacent muscles of the thumb. Probably, septic infection was responsible for this result. In two others, probably, scarring will ensue. There is evidence of atrophy in two cases, for the area of skin previously occupied by acute erythema is now depressed below the surrounding parts. In one (Case VII) the acutely erythematous condition of the fingers has been definitely succeeded by atrophic changes, as already described. Hyperæsthesia lasted for several weeks. Anæsthesia was absolute for several months, and in many is still evident.

The considerations detailed above point to some resemblance between the cutaneous lesions of carbon monoxide poisoning and those belonging to the group of toxic erythemata. In both there is capillary dilatation, and serous exudation and cellular infiltration. The presence of hyperæsthesia and anæsthesia, so striking in the cases now under consideration, are an important difference between the two affections, for they are absent in toxic erythemata. The scarring and atrophic changes in CO poisoning afford a marked difference between the two affections. The association of anæsthesia with erythema indicate that the cutaneous lesions of carbon monoxide poisoning are of the nature of an angioneurosis, and brought about either directly by anoxyæmia, or indirectly through the circulation of toxins produced by faulty metabolism. The persistence of the lesions and their results favour the former view, and point to a marked interference with the nutrition of the skin. If the lesions were due to the circulation of toxins one would expect this to subside soon after the patient recovered from the immediate effects of the gas, and on this supposition the cutaneous lesions should be of brief duration, and clear up completely.

The association of peripheral neuritis with several of the cases favours the view that an angioneurosis is responsible for the condition of carbon monoxide erythema, and it is rather remarkable that in two cases of external popliteal paralysis, erythematous patches were present just below the head of the fibula, and almost exactly over the situation of the nerve. The influence of pressure has already been discussed.

The cutaneous lesions of carbon monoxide poisoning were first described by the writer in a communication to the *British Medical Journal* of November 1, 1913.[1] There is no record of any previous observation of these lesions which, in the writer's opinion, are now fully established as true manifestations of CO poisoning. There was no evidence of burns, or of any fire having reached the district where the survivors were found.

SYMPTOMATOLOGY OF CARBON MONOXIDE POISONING.

A general symptom was a marked feeling of languor and an irresistible desire to rest quite regardless of immediate danger. Those affected wanted to be left alone, and would resent interference even if directed to their advantage. One man was obliged to relieve himself of a pocket full of nails, another of a hammer, another of his cap, for even this seemed too heavy. A colliery manager leading one of the parties, and carrying the canary, when affected by the gas felt his grip upon the wooden cage weaken, and imagined his fingers were swollen. These symptoms were usually brought on by exertion, and were far more evident in those doing hard manual work than in the officials superintending such work. Some relief would ensue from rest, but this would be of brief duration, and recur immediately work or walking was resumed.

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[1] *Brit. Med. Journ.*, 1913, ii, p. 1181.

Tinnitus aurium was one of the earliest symptoms. Headache was general, and first felt at the back of the head, and described by some as amounting to a severe pain. Some complained of a feeling of constriction as if the head were encircled by a band which could be tightened by a screw. Others said they had a feeling as if the crown of the head was being lifted off, or a sensation of expansion of the head, or a feeling of the head splitting in two. One said that his " head felt double the size." A marked feeling of "throbbing in the temples" was present in many. Headache was delayed in some, and absent in a few. A feeling of contentment or complacency was general even in those suffering from the various subjective sensations described above. Many were fully aware of their dangerous position, but strangely there was no mental distress, and they would lie still and make no effort to move on to a place of safety. In some the mental state was one of exhilaration, even when prostrated and conscious of extreme danger. Such cases would desire to rest, and would not actively assist anyone desirous to help them. All precaution would be abandoned, and one leader of a party carried the canary mechanically, and ceased to take any further notice of its movements. Many said that their sense of humour was increased as in the early stages of alcoholic intoxication, and jokes and pleasantries would be exchanged between the mine officials and the working men. Many responsible officials who ordinarily possess a keen sense of authority and duty would joke with their subordinates, although fully conscious of doing so, and indeed they would mentally reprove themselves for being "childish." Some were greatly amused at the gasping appearance of others, although fully aware that their own condition was very similar. Others, again, would exhibit hysterical symptoms such as immoderate laughter, shouting, or singing, and in this respect one said that the effect in his case was very similar to that produced by nitrous oxide. A mild degree of delirium was produced in some instances, and one of the mine officials when affected became excited on reaching fresh air, and raised his lower limbs in walking in a manner resembling the "turkey trot." Some were happy and depressed in turns, others were irresponsible and indifferent as to their language to their superiors. One man in this respect behaved similarly when "gassed," as on another occasion when observed by the writer to be under the influence of alcohol. Giddiness was complained of by many, and several were observed to be ataxic on endeavouring to walk.

Palpitation was a common and early symptom, and accompanied in many by a very tumultuous action of the heart. The members of one party exploring the mine within a few days of the disaster, and when it was possible that some of the workmen were still living, believed that they could hear knockings which they attributed to the presence of entombed men, but which were really due to tumultuous heart's action, and which became audible to others. Another party which suffered in the same way said that they could plainly hear one another's hearts when all were silent in a remote part of the mine.

Breathlessness was common, and was probably in many cases partly cardiac in origin. Some described this as being asthmatic in character, others as "heavy and deep breathing," others, again, said their breath was "heavy and gasping."

Weakness of the lower limbs was general, and described by some as a giving away of the knees; others as a sagging of the knees; others stated that their legs became tremulous and weak; another said that his legs failed to support him, and "felt like rubber"; another said "his legs were like whips"; others that their feet became too heavy. One, the official already mentioned, whose gait and behaviour excited some amusement, said that his lower limbs seemed very pliable, and he felt capable of performing almost any acrobatic movement. This was partly due to his mental state of exaltation, and partly to the flaccid condition of the lower limbs.

Vomiting occurred in some instances and gave relief. This happened in a few cases on reaching fresh air, and was attributed by one to the administration of oxygen.

Headache, malaise and lassitude were present for days in most cases, and some complained of failure of memory for some time. Those who continually inhaled small quantities of carbon monoxide gas, as, e.g., those at work on the bashings, were subject to a cumulative effect, and general failure in health was the result, and neurasthenia. It is the opinion, too, of many of the leading mining experts that respiration is permanently affected after such work. The writer hopes to verify this by further observation of those affected at Senghenydd.

TREATMENT OF AFTER-DAMP POISON.

Preventive.

Miners in each district of the Colliery should be subject to discipline and in charge of the district fireman. When an explosion occurs the fireman should warn all the men to this effect by a recognized signal, such as ringing of an electric bell. The men should assume comfortable reclining positions on either side of the road, in a place selected by the fireman as being the best situated to obtain the purest air available. He should then inspect the roads leading from the district and ascertain if escape be possible.

The efforts of the men to escape have already been described, and the onset of symptoms in almost every case followed the exertion of walking quickly up the inclined road. Some also were considerably more excited than others.

The party of men was almost wholly overcome by the time the double parting of the district was reached, and most of the bodies were found in groups close to this spot. It is difficult to explain why eighteen men survived and why eighteen men died, for there were no marked differences of age, general health and habits. Their respective positions also were somewhat similar, for almost all were found reclining against the side, and in some places the dead and living were mixed together. Many of the men in endeavouring to escape traversed the road leading to the Mafeking return, and it is possible that some went farther than others, and so were worse affected by the vitiated air of this part of the mine. Moreover, the concentration of the men at the double parting of the district must have lessened their ultimate chances of escape.

There is, of course, the question of varying susceptibility to the effects of after-damp poisoning, and this must have been partly responsible for the result.

When escape by the comparatively short route along the No. 1 North Road was impossible the men would have done more wisely to remain in the district than to traverse the long and difficult road heavily charged with the fumes round to the main level of the mine.

A supply of oxygen kept in the district would have probably saved the lives of many, for some of the survivors were hardly affected and only in a drowsy state. Inhalation of oxygen would have revived these men, and they could then have assisted the others. A knowledge of the administration of oxygen could be included in the instruction given to miners in first aid classes, which are so well attended in the Principality. Large cylinders of oxygen should be kept in each district, and fitted with several gas-bags, which could be filled and used to resuscitate those affected by the after-damp.

Again, miners under such circumstances should drink the cold tea which is their favourite beverage when at work, and unless they have taken food recently they should partake of that in their boxes. The "jacks" and "boxes" found in the Bottanic district of the Senghenydd Mine at the time of the rescue were for the most part full. Thermos flasks containing hot tea and milk, or hot coffee and milk, would be better than "jacks" containing cold tea.

Curative.

In the treatment of a person suffering from after-damp poisoning, unless removal to fresh air can be carried out immediately, treatment should first be applied on the spot. The oxygen cylinders attached to the breathing apparatus of the rescue brigade can be utilized, and the air around the patient fortified by an ample supply of the gas. Artificial respiration can be performed at the same time.

Inasmuch as most of the survivors in the Senghenydd mine were found in a sitting position, this was maintained and artificial respiration performed by the Howard method. These measures proved to be effective, even in the worst cases suffering from collapse. Massage and brisk friction of the limbs too were useful, and strychnine hypodermically. In less affected cases in which stupor was a feature vigorous shaking and flipping measures were adopted.

The application of lotio calaminæ seemed to relieve the pain of the erythematous lesions after the patients were removed to hospital.

In many of the explorers who were "gassed" artificial respiration by the Schäfer method was best. Oxygen was administered whilst the movements were being performed. Owing to spasm of the upper limbs (Case I), erythema, œdema of the hand (Case VII), and burns on the limbs in many others, the Silvester method of artificial respiration was inapplicable, and this too would have hindered the simultaneous administration of oxygen.

As regards transport, various means were adopted at Senghenydd. Ambulance trams for conveying injured or "gassed" miners should be devised for use in collieries. A wheeled support across which a stretcher or blanket could be suspended would be useful as a means of transport from distant parts of the mine; commonly, in ordinary cases of injury occurring in the mine, the coal trams are used as a means of transport, but these, for obvious reasons, are unsatisfactory, and may seriously aggravate such injuries.

The patients should be covered up warmly with blankets or rugs, for on removal from the hot air of the mine to the relatively cold outer air serious collapse is apt to take place, as happened in some of the Senghenydd cases. A small hospital should be permanently established as near as possible to the colliery. All men suffering from the effects of after-damp poisoning should be carried, and under no circumstances should be allowed to walk home, for symptoms may be delayed and come on suddenly.

It is important that restorative measures should be carried out as far as possible in the mine itself, for the difference of temperature and pressure at the surface may lead to a relapse, as happened in some of our cases. This is probably due to the sudden liberation of small bubbles of the gas, which might form emboli in the brain and elsewhere.

RESCUE BRIGADE WORK.

The brigades equipped with special self-contained apparatus rendered fine service in the work of rescue and exploration. The first rescue party to arrive was the Rhymney Valley rescue car with eleven men in charge of Superintendent Kitto, at 10.30 a.m. The nearest rescue station was Porth, ten miles distant, but the brigade from there did not reach the mine until half an hour later than the first named, owing to trouble with tyres and to the fact that they were not summoned to the scene of the disaster until 10 a.m., nearly two hours after the explosion; thus valuable time was lost, inasmuch as before their arrival it was impossible to repair the damage done to the water-pipes owing to fumes and smoke.

Had a rescue brigade been on the spot the water-pipes could have been repaired immediately, and efforts directed against quenching the fire raging in the main west level would have been far more likely to have been attended with success than three hours later. Whilst immediate measures were being taken to combat the fire, probably others of the rescue brigade with breathing apparatus might have been able to reach the West York district, and possibly also the Bottanic district, and thus many more lives would have been saved. This view is supported by the following considerations. The districts already mentioned were far more favourably placed for the purposes of rescue than the others. One man employed in the West York district actually escaped from a point about 20 or 30 yards below the engine on the incline; he was blown down, but uninjured, and, as he expressed it, he made a bolt for the shaft, and groped his way out, and fell unconscious close to the bottom of the upcast shaft. The West York district was explored on the day following the explosion and the air found to be tolerable. Several men had made their way to within 20 yards of safety and their bodies were recovered the next day. Most of the others working on the coal face had traversed several hundred yards before being overcome.

One of the bodies found in a group close to the Mafeking return was brought up on the next morning, and bore the appearance of not having been long dead. The body was examined by several medical men, who formed this opinion independently.

Again, with regard to the Bottanic district where the eighteen men were eventually rescued, the committee of experts determined that after an examination of No. 1 North Road at 9 a.m. and at 1 p.m. on the day of the explosion, rescue operations in this direction were impossible.

It is highly probable that had the mine had a permanent rescue brigade of its own, equipped with the breathing apparatus, an attempt would have been made much earlier to reach the Bottanic district. The rescue brigades which came from other places were not acquainted with the mine, and proceeded almost immediately to attack the fire and repair the water-pipes. They were informed that no lives could have possibly escaped the immediate effects of the explosion.

These considerations strongly support the view that each mine should have its own rescue brigade, consisting preferably of men drawn from the ranks of the officials who possess an intimate acquaintance with the workings, which are varied and often complex. Rescue brigades for mines should consist of very carefully selected men. They should be in charge of a brigade superintendent qualified by long experience, and capable of instructing the men and maintaining thorough discipline.

It may seem almost unnecessary to suggest that the men should be of good physique, and that medical examination should be made at intervals, and immediately before undertaking any rescue work. However, at Senghenydd a brigade man collapsed whilst taking part in the exploration of No. 1 North stables. The heat was intense and the fumes dense, with the result that one of the men was overcome and had to be carried out by the others. On subsequent examination it was found that he suffered from heart disease, and had been unable to work for three weeks, and on the day of the explosion he was actually under orders to attend the Cardiff Hospital for special examination. The apparatus was confiscated, but afterwards found by Professor Haldane to be in thorough working order. As a result of this, the other brigade men were medically examined, and two more men were certified unfit for the work.

The question of temperament, too, is of great importance in the selection of men for rescue brigades in mines. It transpired that whilst the brigades were removing the bodies from the York West district, one of the men took fright and ran back. With this single exception the men constituting the various brigades were fearless, and were of great service in the work of rescue and exploration.

If, as already suggested, each mine had a rescue brigade, trained and always ready for any emergency, the superintendent in charge would have ample opportunity of knowing his men and rejecting those unfit by temperament or for any other reason. In such a permanently instituted brigade, too, much advantage would be gained from the men becoming well acquainted with one another, which is so necessary for the purpose of discipline and co-ordinated work.

The brigade should have a medical officer to examine the men at intervals, and to instruct them in principles of first aid, and it would be a great advantage if he could attend the practices and accustom himself to the use of the apparatus.

Then as regards the training of rescue brigades, this should be carried out under conditions which resemble the actual as closely as possible. Arrangements should be made for filling the galleries of rescue stations with a certain percentage of irrespirable gases, such as carbon monoxide, and sulphur fumes and smoke. The brigades, too, should have frequent practice in the mine itself, and operations could be carried out in the various districts with obstacles here and there to simulate falls of roof. Moreover all the men should possess a good knowledge of first aid, together with that of the chemistry relating to gases, and the administration of oxygen.

Whenever an accident happens in the mine the brigade should be summoned to attend the injured and convey to the surface. One of the brigade men at Senghenydd whilst assisting to carry a body slipped and was momentarily stunned. Instead of transferring the wounded man to the stretcher, and removing him with all speed to fresh air, some of the others ran for help to the base 50 yards away. Had these men possessed an intimate knowledge of first aid principles, and been accustomed to put these into practice, their first consideration would have been to convey their injured colleague as quickly as possible to fresh air.

In actual operations the men should be thoroughly fresh, and have had a good meal before descending the mine, and should not take alcoholic liquors in any form.

The various brigades should work in shifts, for it is of vital importance that the men should not be exhausted by overwork, as they are then much more prone to be affected by the after-damp, and to suffer acutely. One man at Senghenydd collapsed after being at work continuously for twenty-one hours. This was the result of physical exhaustion, and not to a defect in the apparatus, which was afterwards found to be in good working order. Immediately symptoms of poisoning are experienced, or observed by others, the man should desist, and return to the surface, and afterwards should not resume work until he is pronounced fit by the medical officer of the brigade.

As far as possible a close watch should be kept by all members of the party upon each other for signs of after-damp poisoning, and no one should be allowed to proceed alone to any part of the mine. Should the conditions prevent the brigade working together, then a line of communication should be maintained from a fixed base.

The rescue party should never go without a canary previously noted to be chirpy and lively. The bird, in a cage fitted with a small oxygen cylinder, should be carried by the leader of the party and kept by the left hand on the corresponding shoulder, where its movements could be constantly observed. The position of the bird is important, inasmuch as carbon monoxide gas is lighter than air, and is uppermost. One exploration party at Senghenydd almost ended disastrously by omitting to observe the above precautions. The earliest sign noticeable in the bird is a ruffling of the breast feathers, then it becomes unsteady, and assumes a position of roosting, which it would retain until it fell off the perch.

The plan adopted by the superintendents of the rescue brigades at Senghenydd, to whom I am indebted for the account of the symptomatology of carbon monoxide poisoning in birds, was to shake the canary off its perch whenever it showed a tendency to adopt a roosting position, and if it failed to rise from the floor of the cage, or fluttered its wings in an attempt to do so, this was sufficient evidence that the bird was affected. A constant watch should be kept for evidences of early embarrassment in the bird. When the canary was put suddenly into an atmosphere charged with carbon monoxide it fluttered quickly and died, but rescue parties should not wait for this, inasmuch as an atmosphere highly dangerous to life may be reached before the canary actually dies in the way indicated.

POST-MORTEM APPEARANCE OF 400 BODIES.

This refers to external appearances for the most part, inasmuch as permission could not be obtained to do any dissections. Although some of the bodies were not recovered for several months, and were consequently in an advanced state of decomposition, yet typical signs of carbon monoxide poisoning were present in nearly every case.

The colour in most instances was bright pink, and was evident even in portions of flesh exposed by injury, such as in torn ends of muscles around joints from which the limbs had been blown off. This indicates the firm stability of the compound formed by the union of carbon monoxide with hæmoglobin.

In no instance were false teeth found to be loose, and this points to the absence of convulsions in most instances. In one only was the tongue found to have been bitten. The tongue in a large number of bodies was swollen in almost the whole of its extent, the tip only remaining normal in size, and considerable difficulty was experienced in removing false teeth for the purposes of identification.

Superficial burns on exposed parts were common, and in a large number of instances coal dust had been driven into the skin and had to be scraped off before the typical colouring could be ascertained. The features of many of the earlier bodies were swollen, and a sanguineous froth exuded from the mouth and nostrils, and showed the typical coloration.

A small pool of blood was found by the side of one body and was fluid even after the lapse of thirty hours, and of a characteristic bright pink colour.

Fractures and dislocations of almost every possible variety and description were found, and such was the terrible force of the explosion that some bodies were blown to pieces and the limbs of others evulsed at the joints, even the lower limbs being separated in this way, without fracture, from the hip-joints.

Most of the bodies were found close to the coal faces and were, for the most part, in groups within 100 yards of the working places. The positions were variable, and many were killed whilst actually at work, and just fell over from the position they were in at the time. Thus many were found actually at the coal face on their knees, hauliers beside their trams, and engine men in their seats. Some had tied mufflers round the mouth and nostrils, others their vests or waistcoats; another had plugged his nostrils with cotton-wool.

There were evidences in some instances that boys had been carried before both were overcome. Four men had rushed out in one district, arm in arm, and had fallen together about 60 yards from the coal face. Five bodies were found in No. 1 North Road under a fall and recovered five weeks after the date of the explosion. They were men working in the Bottanic district, and were seen by the survivors after the explosion happened. One was a master haulier and a man of experience, and probably he persuaded four others to accompany him in a bid for safety. These men rushed to meet their doom, for the No. 1 North Road at the time was heavily charged with after-damp, which entered the narrow passage leading to the Bottanic district, and which convinced the others that escape in that direction was impossible. The bodies of these men were greatly mutilated, but one showed unmistakable evidences of carbon monoxide poisoning, and thus the injuries must have happened either after death or whilst he was in an unconscious state from asphyxia.

In the West York district four men got within a short distance of the shaft before being overcome, and were at variable distances from 15 to 100 yards, proportionate to their respective strengths. All had fallen forward on their faces, and evidently whilst running. Ten others had traversed 600 yards before becoming unconscious on the main road, close to the Mafeking return. These were in groups of three, and appeared to have sat together and gone off to sleep. The district overman had halted his men in-bye to this point, and decided to make a test of his own life. Thus, amidst the gloom and horror of a terrible disaster, there were evidences of heroism of the finest description.

I am particularly indebted to Dr. Philip James, the colliery practitioner, for much valuable information, and to many of the colliery officials for their courtesy and help.

DISCUSSION.

Dr. J. S. HALDANE, F.R.S., said that although it was clear that in the cases described no burns were caused by the explosion, he would like to ask Dr. Davies whether it was equally clear that burns from lighted lamps were also excluded. Burns from this cause were not uncommon in the case of miners affected by carbon monoxide, even when consciousness was not completely lost. The late Sir Clement le Neve Foster, Chief Inspector of Metalliferous Mines, recorded the fact that when partly stupefied by carbon monoxide he was badly burned on the hand and wrist by a candle, without noticing the fact at the time. The lamps of the Senghenydd survivors would continue to burn in the poisonous air, and might possibly cause burns. Red patches seemed to have been observed when the men were found. This, and the irregular distribution of the patches, would seem to suggest the possibility of burns or other local injuries. The experimental evidence showed clearly that the symptoms of CO poisoning were due solely to lack of oxygen, caused by the temporary impairment in the oxygen-carrying power of the blood. But the peripheral parts of the body, including nerves, were much less sensitive to oxygen-want than the central nervous system, and it was somewhat difficult to believe that peripheral affections could be produced in so short a time as a few hours. If, however, they were so produced, they ought to be found in cases of coal-gas poisoning, which was also due to CO. He did not think they had been noticed hitherto, but possibly this was because they had not been looked for.

Dr. D. J. THOMAS (Bargoed) described the condition of the survivors when rescued, and said that no one was in a better position to undertake the investigation of the effect of carbon monoxide poisoning in the Senghenydd disaster than Dr. Ivor Davies, who had charge of the temporary hospital established close to the colliery.

Dr. TURNEY gladly recognized the great interest of Dr. Davies's communication, and welcomed it on behalf of the Neurological Section. He could not, however, forbear from offering something in the way of criticism of Dr. Davies's interpretation of the erythematous patches as neurotrophic lesions. From that point of view their distribution was very remarkable. Their commonest site appeared to be the buttocks, but they were also seen between the shoulders, and in one case, at least, over the head of the fibula. He could not help feeling that this distribution was strongly suggestive of pressure as forming, at all events, a large element in their causation, and the circumstances under which they were produced seemed to him to favour that explanation.

Dr. WILFRED HARRIS said that the paralyses developed in Dr. Davies's patients were clearly pressure palsies of the sciatic and musculo-spiral nerves, and were not in any way a direct result of carbon monoxide poisoning, or of any other form of toxæmia. The obvious explanation of the paralyses was prolonged pressure upon the nerves above mentioned, due to the men lying unconscious on the hard ground in the same position for over twenty hours. A similar argument in favour of a traumatic neuritis of the cutaneous nerve filaments, due to prolonged pressure, fully explained the patches of erythema with anæsthesia upon the buttocks.

Dr. IVOR DAVIES, in reply to Professor Haldane, said that there was no evidence of fire having entered the district where the men were found, and no evidence of burning on their clothes. Moreover, the erythematous lesions were on covered parts, and mainly on the buttocks, and in situations where it would be highly improbable for safety lamps to be the causal agent. Again, their persistence and character, especially the combination of hyperæsthesia and anæsthesia, made some neuropathic factor highly probable, and this, too, was supported by the association of peripheral neuritis in the same case. He (Dr. Davies) believed that pressure may have determined the site of the skin lesions, but on account of the special character of the lesions he did not believe that pressure was solely responsible for their causation. In one case (VII) there were almost symmetrical areas of skin affected by erythema in the pectoral regions, and as the man was found in a sitting position, pressure could not have been the cause of the lesions. The bilaterality and symmetry of the lesions in his case, too, supported the view that some general cause was in operation. He thought it very unlikely that pressure could produce the lesions attributed to peripheral neuritis. The external popliteal nerve was involved in all but one case, and cases of pressure paralysis of this nerve were almost unknown, and the long duration of the cases, too, pointed strongly against pressure as being the cause.

Sections of Neurology, Ophthalmology, and Otology.

COMBINED MEETING.

February 26, 1914.

Mr. William Thorburn, President of the Section of Neurology, in the Chair.

DEMONSTRATION OF CASES OF NYSTAGMUS.

Uniocular Nystagmus with Optic Atrophy.

By Wilfred Harris, M.D.

C. B., a married woman, aged 31, came to St. Mary's Hospital on account of pain in her left shoulder-joint, which was found to be due to slight arthritis. Her right shoulder is quite fixed as the result of an old injury and operation upon the joint, and her left hip is dislocated from old chronic hip-joint disease. Constant rapid vertical nystagmus was noticed in the right eye only, the rate of the oscillations being about 300 per minute. No trace of nystagmus in the left eye, even on direct ophthalmoscopic examination. She then stated that the vision in her right eye had been defective for the past sixteen years. R.V. $\frac{3}{60}$, L.V. $\frac{6}{36}$, with glasses. There is a well-marked primary optic atrophy of the right disk, the left disk being quite normal in appearance. The pupils are active to light, and the knee-jerks are brisk, no signs of nervous disease being found.

Syringo-bulbia with Unilateral Nystagmus.

By Wilfred Harris, M.D.

H. B., an unmarried woman, aged 35, five years ago first noticed pins and needles sensation over the right side of the chest, and about the same time noticed diplopia, and an appearance of constant oscillation of objects looked at. Two months later weakness developed gradually in both right arm and leg. During the last year slight weakness has developed on the left side. Her right hand is clumsy, and she is unable to write. No difficulty in walking, except that right leg feels somewhat stiff.

Cranial nerves: Occasional diplopia. Coarse slow nystagmus of both eyes on conjugate movement to the right. On looking to the left there is slight lateral nystagmus, with quicker movement of the eyes. There is slight right ptosis, and also slight weakness of the right side of the face. There is well-marked hemiatrophy of the right half of the tongue, and the sense of taste is only partly deficient on the right side. There is also paresis of the right half of the soft palate, and abductor paralysis of the right vocal cord.

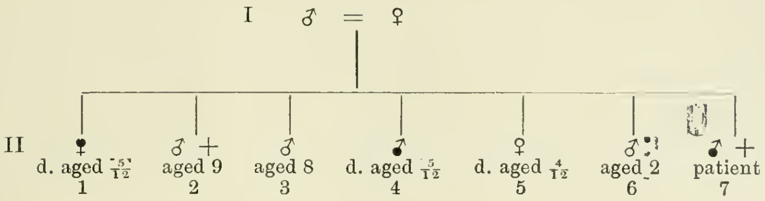
Sensation: She complains of a tightness (girdle sensation) around the right leg and ankle, and she has frequent neuralgic pains in the right arm and leg, and occasional tingling in the left fingers. There is analgesia to pin-prick and thermanæsthesia over the collar area and back of the head, as far down as the clavicles, and extending down the outer sides of the arms, corresponding to the second, third, fourth and fifth cervical posterior root areas on each side, though more extensive on the left side.

Reflexes: Knee and Achilles-jerks brisk, no clonus; bilateral extensor plantar reflexes.

Hereditary Nystagmus with Head Movements (Ambi-sexual Inheritance).

By E. A. Cockayne, M.D.

The father and mother are both healthy and unrelated, and know of no other case of nystagmus, hypospadias, or congenital heart disease in their respective families.



♂ = Unaffected male.
●♂ = Male with nystagmus.
♀ = Unaffected female.
+ = Hypospadias.

II 1: Marked lateral nystagmus noticed shortly after birth. Taken to Temperance Hospital because of the eye movements at the age of 5 weeks. Shortly after this lateral movements of the head began and became very marked. Nystagmus and head movements persisted till death at the age of 5 months from wasting. Light brown hair, blue irides.

II 2: No nystagmus. Light brown hair, blue irides. Well-marked hypospadias of glans penis with typical hooded prepuce.

II 3: Light hair, blue irides. No defect.

II 4: Lateral nystagmus noticed at the age of 2 or 3 weeks. Lateral movements of head began soon after. Both persisted till death from acute diarrhœa and vomiting at 5 months. The child was taken to a doctor at the age of 1 month on account of nystagmus. Light brown hair and blue irides.

II 5: No nystagmus. Light hair. Cyanosed from birth and died of congenital morbus cordis at the age of 4 months.

II 6: No defect. Light brown hair and blue irides.

II 7: Shown to-night. Lateral nystagmus noticed two or three weeks after birth. Lateral head movements seen soon afterwards, but much less marked than in the other two children. The child is rickety and has frequent attacks of bronchitis and gastro-enteritis. After the age of 8 months head movements were only visible during these attacks, and the nystagmus was intensified. The nystagmus is lateral and varies considerably. It is rather slow. Mr. William Lang kindly examined the eyes, and found no ocular defects. Light brown hair, blue irides. Hypospadias of glans penis, with hooded prepuce, is present.

According to the mother the three children with nystagmus were fairer than the others.

Professor Karl Pearson has kindly examined the hair and reports: "Pale yellow, diffused pigment. No granules. A few vacuoles." The hair is albinotic.

The family is interesting in that hypospadias, which is so commonly hereditary, and congenital morbus cordis, a condition occasionally hereditary, are also present, though not necessarily associated with the nystagmus.

A single case of imperforate anus in an unaffected member of a nystagmic family is reported by Burton Fanning, but no defects have been noticed in the many others reported. Manson, however, noticed a digital deformity inherited independently of lamellar cataract, and Nettleship a similar deformity in two colour-blind families, but also inherited independently. Nettleship has collected most of the pedigrees of nystagmic families in his Bowman Lectures, and in a paper read before the Ophthalmological Society in 1911. I give references to one or two others of this type.

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Hereditary Nystagmus (Male Limited Inheritance).

By E. A. COCKAYNE, M.D.

THE three cases shown are members of the same family, and are marked III 6, III 16, and III 18 on the pedigree. From the pedigree it will be seen that they belong to that form of nystagmus in which the males alone are affected, but in which the disease is transmitted through the unaffected female. This is much rarer than the form showing the ambi-sexual type of descent. They agree with the other published cases in that head movements were never present, but differ in that vision is very good and that there is well-marked pigmentation of the iris and choroid. The error of refraction is very slight. Cases showing these characters are very unusual, and have chiefly occurred in the ambi-sexual group. As in other pedigrees, there have been large families, but many deaths at an early age.

The grandfather, I 5, was an Italian, who came to England with General Garibaldi. He is stated to have had a well-marked lateral nystagmus, very good vision, and very dark brown, almost black eyes. The only two daughters who lived sufficiently long to marry transmitted the condition. The eldest daughter, II 1, has brown eyes and good vision. Two sons out of five inherited the nystagmus, the five daughters were normal.

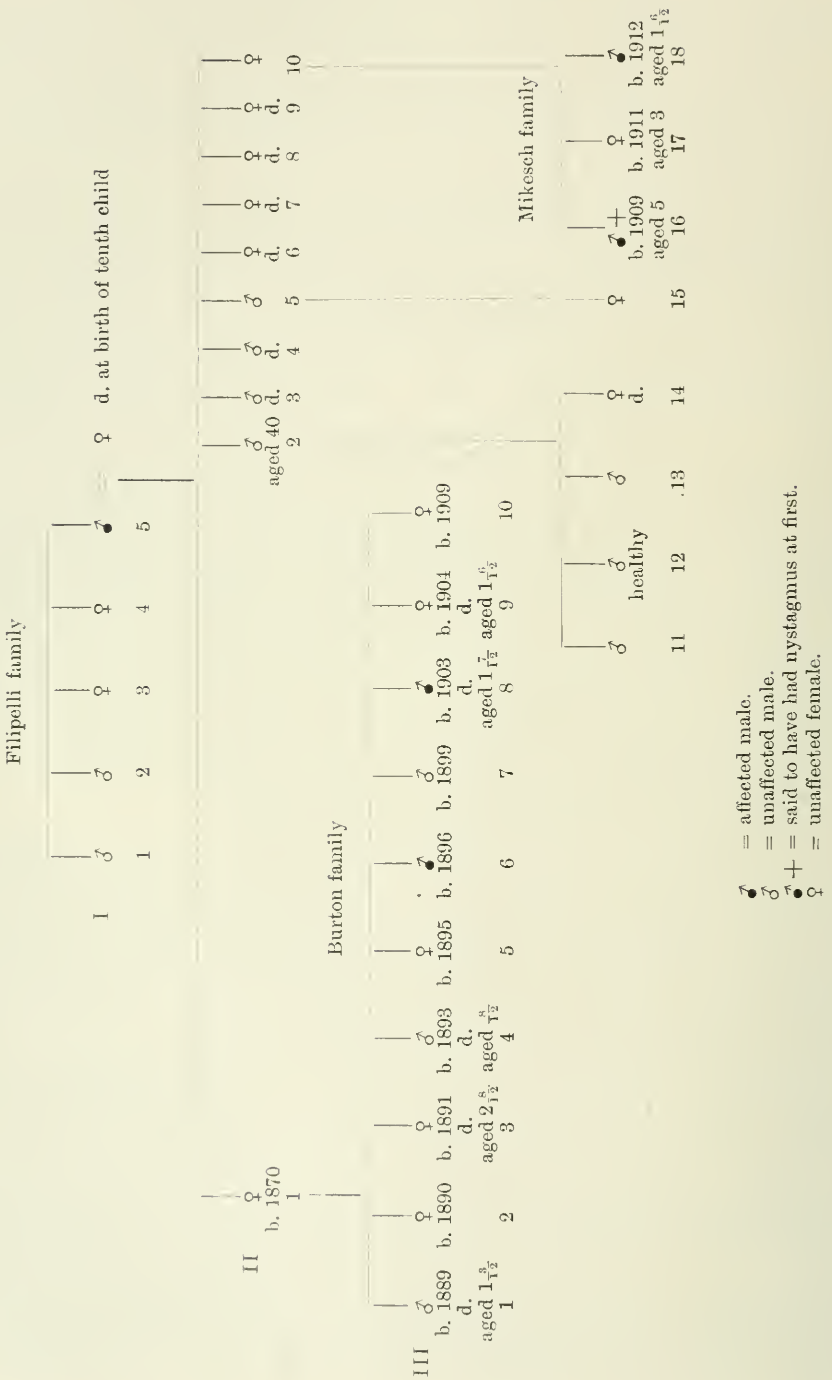
The patient shown to-night is aged 17. He has a constant lateral nystagmus, less marked on looking straight in front, increased on looking to the right or left. He has good vision. Mr. B. T. Lang, who kindly examined him, says there is slight astigmatism. V. $\frac{6}{12}$ in each eye. R., cyl. +0·5, 110 / $\frac{6}{12}$; L., cyl. +0·5, 70 / $\frac{6}{12}$. Vision was not improved by glasses. Media clear, fundus normal, pupils equal, choroid well pigmented, irides dark brown. There is a very slight vertical squint. He was seen ten years ago by Dr. Forbes Winslow, who stated that he had congenital nystagmus, which did not affect his vision. All his brothers and sisters had dark hair and dark brown irides.

The other daughter, Mrs. Mikesch, II 10, also has brown eyes and good vision. Her eldest boy, III 16, shown to-night, is stated to have had lateral nystagmus without head movements. The mother was very ill after the birth, and only noticed the movements when the baby was a month old. The movements were at first rapid and wide in range, but gradually became less noticeable and ceased when he was aged 1 year 3 months. He has good vision, irides now becoming brown, choroids normally pigmented. No nystagmus on extreme lateral movement.

The girl, III 17, has brown eyes and light hair.

The other boy, III 18, has had nystagmus since it was first noticed soon after birth. The nystagmus is lateral, but varies in rate and in excursion, becoming shorter and more rapid on looking straight in front. Mr. B. T. Lang says he has slight astigmatism, of about the same degree as his cousin, and too little to affect his vision. The fundus is normal and media clear. Irides blue, hair light brown.

Mr. J. F. O'Malley kindly investigated the vestibular functions very carefully in the elder boy, III 6, and as far as was possible in the younger, III 16. The elder showed abnormal equilibration on the first occasion, but normal later. Rotary nystagmus could not be obtained, but neither could it be obtained in two girls, partial albinos with marked lateral nystagmus. It is probable that the lateral movements became so greatly reinforced by vestibular stimulation that the usual rotary movement was made impossible. This is supported by the fact that rotary movements of normal type were induced in the boy III 16, who no longer shows spontaneous lateral movements. Mr. O'Malley's notes are appended.


Filipelli family
I
1 ♂
2 ♂
3 ♀
4 ♀
5 ♂●
♀ d. at birth of tenth child
II
♀ b. 1870 1
♂ aged 40 2
♂ d. 3
♂ d. 4
♂ 5
♀ d. 6
♀ d. 7
♀ d. 8
♀ d. 9
♀ 10
Burton family
III
♂ b. 1889 d. aged 1 3/12 1
♀ b. 1890 2
♀ b. 1891 d. aged 2 8/12 3
♂ b. 1893 d. aged 8/12 4
♀ b. 1895 5
♂● b. 1896 6
♂ b. 1899 7
♂● b. 1903 d. aged 1 7/12 8
♀ b. 1904 d. aged 1 6/12 9
♀ b. 1909 10
Mikesch family
♂ 11
♂ healthy 12
♂ 13
♀ d. 14
♀ 15
♂●+ b. 1909 aged 5 16
♀ b. 1911 aged 3 17
♂● b. 1912 aged 1 6/12 18
♂● = affected male.
♂ = unaffected male.
♂●+ = said to have had nystagmus at first.
♀ = unaffected female.

I can only find seven previously recorded families of this type. Of these the two largest, Auden's and Lloyd Owen's, show similar characters in the affected members, and both families live in Birmingham, so that, though this was not actually proved, they are probably related. Nettleship's families are both doubtful, for though only males were affected, nystagmus was only noted in one generation. Frank's is also doubtful, because the sex of many members is not given. The male affected married twice and had families by both wives. In both of these unaffected females transmitted the condition to one or more children.

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NOTES OF THE CASES (by MR. J. F. O'MALLEY).

Case I.—Miss B. C. Cochlear and vestibular function: Albinism, red reflex, very pale blue irides, very pale choroid, astigmatism, light yellow hair. The history of any ear trouble is negative. Patient complained of giddiness on descending stairs, and a tendency to fall forwards, which has been relieved by wearing glasses. This giddiness was not accompanied by nausea or vomiting. Hearing normal. Nystagmus—The patient has a spontaneous oscillatory nystagmus. With the eyes directed towards an object straight in front of them or upwards or downwards in the middle line, there is practically no oscillation, but on directing them to an object in the left or right of the field of vision, either horizontally or obliquely, they begin to oscillate freely. The movements are always horizontal, never rotary or vertical, the excursions being equal in length and rate. Equilibration—There is no disturbance when standing erect with eyes shut and feet close together.

Caloric test (February 2, 1914), cold (2 pints of tap-water), left ear: Nystagmus—Eyes, deviated to look at object in right field of vision, gave strong horizontal nystagmus, with quick component to right and slow to left, but *no rotary;* eyes deviated to left, oscillations still present, but much smaller than previous to test. Equilibration—Standing, eyes shut, feet together, head erect and face forwards, the patient fell to left; head erect but face turned to left, the patient fell to left and backwards; head erect with face turned to right, she fell to left and forwards. This is typical.

Rotation test (February 4, 1914), right ear: (1) Head erect, face forwards, ten turns in twenty seconds to the left (against the movements of the hands of a watch if the latter is placed on the floor), and then stop. Nystagmus—Eyes deviated to right, gave strong horizontal nystagmus, with quick component to right and slow to left; with eyes deviated to left, only a fine tremor remained. Equilibration—Patient did not feel giddy. (2) Head forwards, face towards floor, ten turns to left (reverse of watch). Nystagmus—Eyes deviated to right, gave strong horizontal, quick and slow, but *no rotary;* eyes deviated to left, oscillations partly arrested, but not so marked as in previous test (Test 1). Equilibration—Very giddy, and patient fell typically to left. (3) Head to left, with face turned about half a right angle to the floor, ten turns to left (reverse watch). Nystagmus—Eyes to right, gave strong horizontal, quick and slow, but *no vertical;* eyes to left, oscillations nearly arrested. Equilibration—Opisthotonic rigidity of trunk and head. Rotary and vertical nystagmus could not be elicited, otherwise the vestibular responses were normal.

Case II.—Miss H. C. (sister of Case I): Albinism, red reflex, very pale blue irides, astigmatism, light yellow hair. Gives a history of earache in childhood. Also complains of giddiness on descending stairs, with fear of falling backwards, which still persists, notwithstanding the use of glasses. No tendency to nausea or vomiting. Hearing normal. Nystagmus and equilibration are similar to Case I. Caloric and rotation tests: The same series of tests have been used as in Case I, and the responses were identical. *No rotary* or *vertical* nystagmus was elicited, otherwise the reactions were typical.

Case III.—V. M., boy, aged 5 (III 16). "Eyes rolled since birth until aged nearly 2." Rotation tests: No spontaneous nystagmus or equilibration disturbance present.

Rotation tests: Head erect, face forward, ten turns to right (with hands of watch, the latter being placed on the floor), then stop. Eyes deviated to left, gave strong horizontal nystagmus, quick component to left and slow to right. Ten turns to left (reverse watch) gave horizontal nystagmus on deviation of eyes to right, quick movement to right and slow to left. Head forward, face towards the floor, ten turns to left, gave on deviation of eyes to right a horizontal and rotary nystagmus to the right, quick movement to right, slow to left. Equilibration—Patient was giddy, and became pale, and fell typically to left when standing with eyes shut and feet together. All these responses were normal.

Caloric: Left ear (hot water at 112° F.), unsatisfactory, as patient began to cry.

Case IV.—W. B., male, aged 17 (III 6), gives a history of some deafness, five years ago, following swimming, but never had aural discharge or earache. The hearing is good, but the condition of the membranes and function tests indicate the presence of some chronic tympanic catarrh. Nystagmus—He has a permanent spontaneous nystagmus, oscillatory in character, the excursions being equal in length and rate. It is of the same type as those noted in Cases I and II, and on deviation of the eyes behaves in a similar manner. Equilibration—There is no spontaneous disturbance of this function.

Vestibular function tests: These tests were made very fully, and on three separate occasions—i.e., January 16 and 27, and again on February 4. On January 16 he was turned ten times to the left and right (forty turns), with the head in the two positions *erect* and *forward*, and followed by the caloric (cold) test in both ears. January 27: He was turned ten times to the left, with the head in two positions—namely, *forward* and *to the left*—and the cold caloric test was also used in the right ear. On February 4 the caloric test was applied first and to the left ear only. Rotation was done ten times to the left in each of the three positions, *erect*, *forward*, and head *inclined to left*, and ten times to the right with the *head forward*.

Rotation: Nystagmus—The responses, when fully elicited, were identical with those already described in Cases I and II. The nystagmus remained horizontal to all stimuli, and was never rotary or vertical; a quick and slow movement could be seen, but less distinctly than when testing a person who had no spontaneous nystagmus. The horizontal nystagmus was greater than previous to turning, when the eyes were deviated to the side of the quick component, and nearly arrested to the opposite side. Equilibration—On January 16 there was no disturbance due to rotation, but it followed the caloric test, and will be given below. On January 27, equilibration disturbance followed the second test applied—namely, rotation ten times to left, with the head inclined to the left side (as in turning test 3, Case I). There was opisthotonic rigidity of trunk and head. On February 4 the same test as the last mentioned was applied, with a like result. With the head forwards and face towards the floor, ten turns to the right (with the watch), gave typical equilibration disturbance.

Caloric: Nystagmus—The responses here were similar to those elicited in Case I. Equilibration—On January 16 the caloric was the last test applied, and it caused disturbance in which the falling was atypical. Instead of falling to the right when standing erect with eyes shut and feet close together, he fell directly forwards; and with face turned to the left he fell forwards to the left; and with his face to right he fell forwards to the right. On January 27 the equilibration was not tested until the nystagmus response had largely passed off, and the patient was then quite steady. On February 4 the case was examined specially, for the purpose of observing the equilibration disturbances caused by the various tests, because of the atypical response elicited by the caloric on January 16. Cold tap-water was used in the left ear to no effect. A quart vessel was filled three times in quick succession, and run from a height of 2 ft., but the patient remained absolutely steady. Rotation tests were then applied, with the typical result already mentioned.

Case of Nystagmus.

By A. E. Russell, M.D.

W. L., male, aged 18, milkman. At the beginning of January, 1914, complained of headache, and at the same time his mother and his fellow-workmen noticed that his eyes were twitching. On examination nystagmus was present when the eyes were at rest in the median position. On lateral movements of the eyes the nystagmus was coarser. External objects appeared stationary. The pupils were equal and reacted normally to light and accommodation. Vision normal, disks normal. No diplopia. Hearing was normal, there was no tinnitus, and no signs of paralysis of any of the cranial nerves. There was no weakness of any of the limb muscles, no sensory disturbances, and no ataxy. There was a fine tremor of hands, not of intention type. The knee-jerks were rather exaggerated, the abdominal reflexes brisk, plantar reflexes flexor.

Briefly, with the exception of the headache and the nystagmus there were no physical signs of disease. The headache gradually improved and has now quite disappeared. The nystagmus has improved slightly.

Nystagmus combined with Defective Movements of the Eyes.

By Angus MacNab, F.R.C.S.

H. B., aged 21. Patient has always suffered from defective sight. She thinks that the defect has increased lately. She also "sees double" and has severe headaches. The head is held slightly turned to the left, with the chin depressed. There is a well-marked lateral nystagmus, and a slight convergent squint, the right being the fixing eye. There is no fixation in the left eye. Ocular movements: On fixation towards the left the left eye lags behind, and there is a nystagmus of slight range, but if the right eye be occluded the left eye increases its range, and the nystagmus becomes much more irregular and of greater range and rapidity. On fixation to the right there is no restriction in range, but there is a nystagmus which is more rapid and extensive, though not so irregular as that on left abduction. The vision when a slight refractive error is corrected is: R., $\frac{6}{24}$; L., less than $\frac{6}{60}$.

Nystagmus on covering one Eye.

By J. F. Cunningham, F.R.C.S.

F. B., male, aged 18. Seen at Moorfields, May, 1913; under the care of Mr. Lawford. The patient is a clerk, and was wearing: R., +3·5 sph.; L., +4·0 sph. With these R.V. = $\frac{6}{60}$, 10J.; L.V. = $\frac{6}{36}$, 10J.; binocularly $\frac{6}{6}$, 1J.; will not tolerate a + sphere added to correction. On covering one eye marked lateral nystagmus is noticed, which ceases as soon as binocular vision is allowed. When fixing with the left eye the right deviates upwards and slightly outwards. The patient states that he had these movements of the eyes when he was aged 4, and that they were worse then. There is no family history of nystagmus. He has dark hair and blue irides.

See-saw Nystagmus with Bitemporal Hemianopia.

By E. E. Maddox, F.R.C.S.Edin.

Mr. F. B., aged 53, carriage builder. History: Four years ago had suprapubic cystotomy for urethral stricture, followed thereafter by slight failure of sight. About February 6 of this year, Dr. G. H. S. Daniell noticed the movement of his eyes and kindly sent him to me. I saw him first on February 16. The appearance of the eyes when viewed from a distance exactly resembled a see-saw, one always rising as the other was falling. On closer inspection the rising of the right eye and the falling of the left was seen to be accompanied by conjugate parallel torsion to the left; the falling of the right and rising of the left by parallel conjugate torsion to the right. When I held a hatpin horizontally at the level of the lower margins of the corneæ the rise and fall of each eye appeared to be at least 1 mm. The oscillations, both vertical and torsional, are strictly undulatory, with nothing *saccadé* about them. Counting one wheel movement and its return as a period of oscillation, there were 152 such periods per minute on looking straight forward. On looking up, however, the movements became quicker and smaller, and were counted as 204 per minute. The vision of each eye is $\frac{6}{24}$, and is least confused on looking up, showing that the greater amplitude of the excursions is more embarrassing than their greater rapidity. Objects appear to him to move slightly. Diplopia only occasional. Now and then attacks of slight head-nodding are noticeable in the sagittal plane. The left knee-jerk is slightly poor. He has *bitemporal hemianopia*, with partial inversion of the colour fields. There is some reason to believe that this form of hemianopia has lasted in his case for some years. The horizontal balance of the eyes exhibits only slight exophoria, and there is only slight right hyperphoria, of a degree sufficiently small to be immaterial. There is, however, excyclophoria of 10°.

This case strikingly confirms the existence of the conjugate parallel torsional innervations 11 and 12, and the contrary vertical innervations 3 and 4, tabulated on page 125 of *The Opthalmoscope*, 1912, vol. x. I have hitherto been unable to furnish more than presumptive evidence as to 3 and 4. It is noteworthy, as proving that conjugate innervations are concerned in this case, that the rising and falling of each eye is exactly the opposite of what an anatomical consideration of the muscles would indicate, since extorsion of each eye is accompanied by a fall of the cornea, though the (extorting) inferior oblique is an elevator, and intorsion by a rise, though the (intorting) superior oblique is a depressor. The see-saw or apparent vertical motion of the eyes in opposite senses is partly an optical illusion due to the greater stretch of visible sclera on the outer side of the cornea than on the inner, but that it is not wholly so is made evident by the experiment with the hatpin, by the rise and fall of the eyelids, and by a prism device I have made which allows one eye to be seen over the other, and the separation between them vertically to wax and wane alternately.

Case of Left-sided Cerebello-pontine Lesion, probably Tumour.

By W. JOHNSON, M.D., and W. M. MOLLISON, M.C.

F. W., AGED 16. The patient has never had any serious illness. Early in 1912 it was noticed that the left eye appeared somewhat staring and that it could not be completely closed. For two years previous to this, however, it had been remarked that the left side of the face was weaker than the right. About the time of the occurrence of the facial paralysis, deafness on the left side also became apparent. In May, 1913, the patient suffered from headaches, which were worse in the morning and passed off during the day. He also vomited every day immediately after breakfast. Soon after this he was operated on, and these symptoms have not since recurred. In July, 1913, he showed a definite tendency to fall over towards the left side when walking.

On the examination of the nervous system in January, 1914, the condition was as follows: There is complete paralysis of the face on the left side and the muscles show early reaction of degeneration. The pupils react to light and accommodation. There is some weakness of the left external rectus, and nystagmus is well marked, the coarse slow movement being to the left. No definite anæsthesia can be made out, but there is blunting of sensation on the left side of the face. The left masseter muscle is much weaker than the right. Taste is lost on the anterior portion of the left side of the tongue. No motor weakness can be demonstrated, nor has the patient complained of trouble in walking. The knee-jerks are, however, exaggerated, there is a tendency to ankle clonus, and the plantar reflex is extensor on the right side; that on the left is indeterminate. Slight inco-ördination of movement is present in the left arm. Walking is a little unsteady and the patient walks on a wider base than normal. Adiadochokinesis is well seen in the left arm. There has been no sphincter trouble.

To sum up, therefore, there is evidence of pressure on the fifth, sixth, seventh, and eighth cranial nerves on the left side, on the left lateral lobe of the cerebellum and on the pyramidal fibres which go to the right lower extremity. Such a condition would be produced by a tumour situated in the left cerebello-pontine angle.

Mr. Ormond examined the eyes: Vision in the right $\frac{6}{9}$, in the left $\frac{6}{24}$. The left pupil reacts very feebly to light, and there is papillœdema on both sides, more marked on the left; there is, perhaps, slight weakness of the left external rectus. The left globe is slightly dropped, due probably to involvements of the corpora quadrigemina. Examination of the ears: Both membranes are normal. With the "noise apparatus" there is total deafness in the left ear; the right is normal. Nystagmus is present; the patient has no vertigo, nor has he ever had any. He had some headache about a year ago but has none now. His walk is slightly ataxic, and he cannot stand on one foot with closed eyes, though he does not exhibit Romberg's sign; dysdiadochokinesis is present in slight degree.

The nystagmus is horizontal and of a slow coarse character when the patient looks to the left, about 80 per minute and very irregular, and quick and fine when the eyes are directed to the right, about 180 per minute. There is a spontaneous pointing error to the right with the left arm. Functional examination of the labyrinths: Caloric test—After prolonged syringing of the right ear, with the head erect, with ice-cooled water, no alteration was produced in the spontaneous nystagmus. The same result was obtained after syringing the left ear. The only effect of syringing the right (the sound side) was that the patient had a tendency to fall to the right. Rotation—The right labyrinth reacts, the left does not. This fact was elicited, not by observing nystagmus, as this is impossible, but by noting that the patient had distinct tendency to fall (to the right ?) after turning in a counter-clockwise direction, and by noting the resulting errors in the pointing tests. After ten counter-clockwise turns (to the left) there was with the *right* arm a pointing error to the left, while the spontaneous error with the *left* arm tended to disappear. After ten clockwise turns there was no appreciable pointing error with the *right* arm, and no change in the spontaneous error with the *left;* but after twenty turns there was a slight error to the right with the *right* arm and distinct increase in the spontaneous error with the *left.* The results of these tests are compatible with a left-sided cerebellar lesion.

Case of Post-traumatic Deafness ; Functional Deafness excluded by Vestibular Tests.

By DAN McKENZIE, M.D.

THE patient is a man, aged 39. On November 6th, 1909, he was working on the top of a wall when it collapsed. He was picked up unconscious and remained so for several days. A doctor who saw him shortly after the accident said that the left tympanic membrane was ruptured. He was very ill for some months and improved slowly. There was no facial or other paralysis, but the ear bled and a provisional diagnosis of fractured base was made. At the present time he is quite deaf to all tests in the left ear, and is so prone to attacks of giddiness, especially in traffic, that he is unable to go out alone.

The question of malingering having been raised, the patient was sent to the exhibitor for examination. Complete deafness was found in the left ear as tested in the usual way, and with the aid of the Bárány noise-machine. Rotation and the caloric test showed a complete absence of the vestibular reactions in the affected ear. Spontaneous nystagmus to right. The lesion is, therefore, organic, and the deafness will almost certainly persist.

I am indebted to Dr. Battersby Jobson, Clinical Assistant to the Central London Throat and Ear Hospital, for the notes on this case.

The case may be contrasted with that case of my list in which the post-traumatic deafness was due to simple neurasthenia without any organic lesion, and was combined with exaggerated vestibular responses.

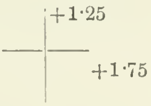
(?) Syringomyelia involving Bulb ; Bilateral Nystagmus.

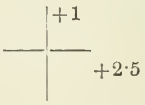
By JOHN FAWCETT, M.D., and A. W. ORMOND, F.R.C.S.

W. B., AGED 28. Was first admitted into Guy's Hospital in 1902, and was under Dr. Newton Pitt's care for six months ; on discharge was considerably improved. He was apprenticed to a plumber in 1900, and was taken ill with what was thought to be "lead poisoning." The arm muscles were wasted; loss of power in hands chiefly on left side; plantar reflexes extensor. "Blue line" on gums; no "wrist-drop." Impaired sensation in feet, and at one time numbness of left side of body. No paralysis of face or tongue; heat and cold sensation normal. No reaction of degeneration. Pain in back and later, in April, 1902, tenderness over second and third cervical vertebræ, and also some hæmaturia and pyuria. Bilateral lateral nystagmus present throughout. Pupils react to light and accommodation. On discharge was able to walk, and went to sea as a steward for three years; then worked on a farm in Canada, where he developed "pneumonia and pleurisy," after which attack he could not walk properly, and returned to England, where from 1905-14 he has been carrying on business in a shop.

In February, 1914, he fell down when walking in the street, and as the power of locomotion had deteriorated greatly he was readmitted on February 12, 1914.

Condition on admission (1914): Bilateral nystagmus, coarse movement to left; finer and more rapid to right, sometimes vertical movements; no rotatory nystagmus. Atrophy of left half of tongue and paresis of left half of palate. Wasting of thenar and hypothenar eminences in both hands, and weak grip, more so on left side. Very spastic gait; loss of power in legs. Extensor plantar reflexes. Marked bowing of cervical and upper dorsal spine, which has developed since discharge from hospital in 1902. Hearing normal. Sensation: With exception of certain circumscribed areas, loss to all forms over whole surface; if pain be excluded, the loss is seen to be a partial one, some appreciation being obtainable if extreme stimulation is employed. Loss of painful sensation more widespread than any other; its presence only demonstrable on face, scalp, and two large areas on face and buttocks respectively. Loss of temperature sensation coincides with analgesic areas, with exception of upper extremities. Indefinite results obtained of sense of position.





Nystagmus—At times horizontal, changing in a few minutes to vertical, and again back to horizontal. The vertical movements are generally noticed when patient's attention wanders. The horizontal ones are more marked when he is using his eyes for fixed attention.

He has some difficulty in reading, but is helped by means of glasses, which correct his hypermetropic astigmatism. Nystagmus is present in each eye. Both fundi are healthy, and the pupils react to light and accommodation.

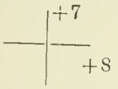
Two Cases of Nystagmus.

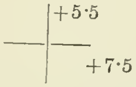
By A. W. Ormond, F.R.C.S.

Case I.

F. J. B., aged 38 in 1909. R.E.: Anterior polar cataract; leucoma adhærens, coloboma iridis. History of inflammation of eyes when aged 3 weeks. L.E.: Vision with glasses, $\frac{6}{9}$.

R.E.:

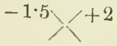


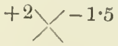


Dissociate nystagmus: R.E.—Movements directed obliquely downwards and outwards; rapid and fine. L.E.—Horizontal movements with rapid movement to the right.

Case II.

H. H., aged 22 in 1905. Congenital nystagmus (?). R.V., $\frac{6}{18}$; L.V., $\frac{6}{24}$.





Horizontal nystagmus; movement of eyes equal. Vision improved with glasses. Fundus healthy; media clear. Condition of eyes noted when he was aged 4.

Case of Intermittent Monocular Nystagmus.

By N. Bishop Harman, F.R.C.S.

R. S., aged 7 months, was seen by my colleague Dr. Wyard at the Belgrave Hospital and transferred to my care.

At the time of the first examination there was constant lateral nystagmus of the right eye; the movement was rapid and fine in character. No movement of the left eye could be seen. The mother stated that she first noticed the movement when the child was aged 5½ months; she is practically certain that there was no movement of the eye earlier than this. She says that when the child is awakened out of sleep there is no movement for the first few minutes, then it comes on and persists until sleep returns. The birth of the child was natural and easy, no instruments were used, and the mother does not remember any marks showing on the baby's head after birth. The mother is young and healthy, and this is her first baby. The baby is lively, feeds and sleeps well. There is no mark on the head, and no tender spot about the face or the skull or neck. There have been no fits, no head movements, no squints, and there is no history of injury by falls.

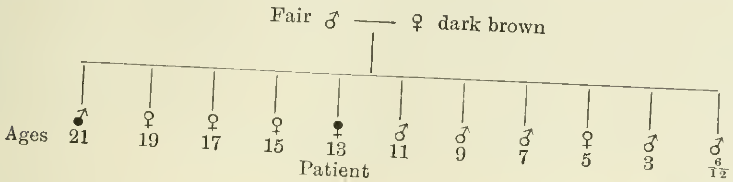
At the second examination the eyes were examined under atropine. The pupils were fully and equally dilated. The right eye was moving rapidly as before. The mother said that since using the ointment the eye had kept steady for a longer time after the child's awakening. Retinoscopy gave a corrected refraction of +1·5D. sph. with +2·5D. cyl. axis, vertical for each eye. The rapidity of the movements of the right eye prevented a certain view of the details of the fundus, but nothing abnormal could be seen. The left fundus was perfect, there was not the slightest movement suggestive of a nystagmus. Covering the eyes alternately did not affect the nystagmus of the right eye or induce a nystagmus of the left. Glasses to correct the error of refraction to within 1D. were ordered.

The child has worn the glasses now for one month and makes no difficulty about them. At later visits the mother has reported that the periods of steadiness of the right eye are longer. At the latest visit she stated that so far as she could make out the eye remained steady at all times, except when she showed something to the child. And this statement was found to be correct. On examining the eyes without attracting the attention of the child both eyes were quite steady; when the child was shown a drop bottle the right eye immediately began to oscillate rapidly in a lateral movement, the left remaining steady.

Nystagmus with Rhythmical Head Movements.

By Leslie Paton, F.R.C.S.

A. O., female, aged 13½. Patient is one of a family of eleven. According to the mother's statement the patient's eyes were normal (?) until she went to school. An elder brother, aged 21, showed similar nystagmus and head movements.



The affected brother had fits at the age of 12 months and at that time showed nystagmus. He recovered from this, but developed it again when he went to school and developed the head movements at the same time. He is now said to be normal. The patient shows a fairly regular nystagmus of variable amplitude of horizontal movement. Under ordinary circumstances no head movements are obvious, but as soon as she attempts to look fixedly at an object the head begins to move rhythmically. The eye and the head do not move absolutely synchronously, but the head movements are closer to the time of the eye movements than in spasmus nutans. The patient is myopic; fairish, tow-coloured hair; no obvious defects in media or in fundus. Father's family all fair. R.V.: c̄ −3·5 D. sph. ⊂ −2 D. cyl., ax. 160°↙ = $\frac{6}{18}$. L.V.: c̄ −4·5 D. sph. ⊂ −2·5 D. cyl., ax. 170°↘ = $\frac{6}{18}$.

Two Cases of Miners' Nystagmus.

By G. H. Pooley, F.R.C.S.

One case showed coarse rotatory movements on turning the eyes up; the other showed a much finer type of rotatory movement, the movements not being present except after stooping. These two cases represented two different types of miners' nystagmus.

DISCUSSION ON NYSTAGMUS.

Opened by W. T. Holmes Spicer, F.R.C.S., James Taylor, M.D., and Sydney Scott, M.S.

Mr. W. T. Holmes Spicer: The word *νυσταγμός*, according to Hirschberg, originally meant a nodding of the head, as in sleep; the word *ἵππος* being used for rapid movements of the eyes. How the latter word became applied to movements of the pupil it is hardly worth the trouble of inquiry, as the new meaning of each word is now universal.

Nystagmus has been long known, but it is only in the last half century that it has been studied with any care; even Mackenzie, in his great book, gives only eight lines to it. He describes it as an involuntary motion of the eyes from side to side. Later writers have tried to give definitions to the affection which more extended observation has shown to be faulty. Panas defined it as "rhythmic movements of the eyes from side to side, independent of the will," but nystagmus is not always rhythmic, and not always independent of the will. Fuchs defines it as short, jerky movements of the eyes, repeated rapidly and always in the same way; the movements are not always repeated exactly. Uhthoff only allows as nystagmus permanent oscillations of the two eyes on each side of a fixed point; the other kinds are pseudo-nystagmus. As this definition would exclude vestibular nystagmus, and many other kinds dependent on central nervous disease, it is better to take away these limitations and to define nystagmus as an *oscillation* or *trembling* of the eyes.

The movements of oscillation may be equal on each side of a central point, and are then said to be *undulatory* or *pendulum*-like; where the movements are unequal, consisting of a quick followed by a slow one, they are said to be *jerky*. The *direction* of the nystagmus is said to be that of the jerk or quick movement. If the nystagmus is rotatory, it is convenient to consider its direction as clockwise or anti-clockwise; and just as we are in the habit of using the figures on a clock as indicating the seat of a foreign body in the cornea, the same figures can be used as an indication of the range of rotation of the vertical meridian of the cornea.

For the ophthalmologist, naked-eye observation and counting of the rapidity of the movements are enough for clinical purposes, but in the ophthalmoscope we have a means of observing the finest degrees of movement from a mere jelly-like tremor upwards; by this method a tremor will be noticed quite invisible by unaided observation of the front of the eye. Also, movements that are apparently simple to the naked eye will often be found to be irregular or complex by the ophthalmoscope. Various instruments have been used for recording the movements, either by photographing the reflection from the surface of the eye or by using a recording lever which rests on the cornea. For examining the characters of the nystagmus simultaneously in the two eyes it is a good thing to bring the images of the eyes together by a 20° prism.

Varieties and Characters.

Among 200 cases I have found that, taken in order of frequency, nearly 50 per cent. of the cases are horizontal in direction, about 15 per cent. are rotatory, about 12 per cent. are vertical, 4 per cent. are mixed, 2 per cent. are irregular, 2 per cent. are circumductory, 1 per cent. are con-divergent or disjunctive, as it has been called; in the remainder are some odd cases and unclassified ones.

The horizontal and vertical forms vary greatly in rapidity and range; the movements are nearly always conjunctive—that is, the two eyes move up and down or to left and right together. I have seen two cases in which the horizontal movements were not conjunctive, but con-divergent or disjunctive; these movements appear to be involuntary, and are continuous and slow, and I believe they are very rarely seen; each child had also rapid conjunctive horizontal movements—the two forms went on together.

The rotatory forms are generally conjunctive; that is, the vertical meridian of each cornea inclines with the other to left or right, but there is no reason why a disjunctive, rotatory nystagmus should not be seen in which the vertical meridian of one eye would incline to the right and the other to the left. Such a case has been described by Duane.

In the *circumductory* form there is a combination of rotation with both vertical and horizontal movements, so that the centre of the cornea appears to make an excursion round a fixed point. There is no reason why this circumductory form should not be disjunctive, although I have never seen it; it is usually conjunctive. Also the circumductory movement may either be a complete circle or ellipse, or part only with return movement; I have seen both, but the latter is the common form. Sometimes the movements are not simple; there may be two small, rapid movements in one direction with a single sweep backwards. Generally the smaller the movement the more rapid it is; sometimes the movements are very large and slow, occupying the whole of the palpebral fissure. The rhythmical character is generally well marked, but the rhythm may be broken, so that we see constant small and rapid oscillations replaced by an occasional large jerk in the same direction, or in another direction altogether. The change in character of the oscillation generally indicates a change in the position of the eye or an alteration in the child's intention. The change in the intention of fixation sometimes calls into action a fresh set of muscles and produces a change in rhythm of the oscillations. Such a case was one in which there was a left convergent squint with nystagmus, increased in rapidity on abduction up to the middle line; then there was a pause followed by a full, smooth, outward slide of the left eye; there was a spasm of convergence, or a difficulty of conjugate movement, which lasted till the left external rectus got separate action.

Use of the eyes is necessary for the existence of the nystagmus. The eyes are quiet during sleep; they are sometimes quiet in the dark room. A relaxation of attention on the child's part may be accompanied by cessation of movement, often broken into by a series of very rapid jerks on alteration in position of the eyes. The oscillatory movements often diminish in size and violence, and instead of being large and jerky become small and undulatory; this is seen not uncommonly after correction of the refractive error.

Nystagmus on Monocular Fixation.—Many cases have been reported in which, on covering either eye, oscillation in both eyes begins at once; such cases are not uncommon. Here the visual centre requires stimulation from each retina to arouse an impulse strong enough to put the muscular co-ordinating centres into full activity. The opposite of this, nystagmus on monocular covering, may also be seen. In a child with alternating convergent squint, when either eye was covered it became convergent and had horizontal oscillations.

Unilateral nystagmus is not uncommon; if the quiet eye be examined by the ophthalmoscope or be seen after fatigue the number of cases of monocular nystagmus will be greatly reduced, but a great disproportion in the nystagmus in the two eyes is common. The purely unilateral cases are usually vertical, but a few horizontal or rotatory kinds have been described. In one case, described by Duane, the patient was able to see the oscillation in her own eye in a looking-glass, which could only be with unilateral nystagmus.

Sensation of Movement.—When a nystagmus is first acquired there is a sense of movement of objects seen—that is, a miner will say everything dances before him—but this is not so in congenital cases even where the vision is good, and generally the longer the duration of the nystagmus the less the sensation of movement.

Nystagmus does not occur in those who are born blind, or who become so very soon after birth; these eyes wander about aimlessly with large, slow excursions; a certain amount of co-ordination is necessary to produce true nystagmus. Sometimes the visual function seems to be temporarily in abeyance among amblyopes of high degree; among blind children some have permanent nystagmus, and others only have it when their attention and visual function are called into action.

Effects of Light and Dark.—Eyes with leukoma, or cataract, or albinism, oscillate more violently if light is thrown into the eye; others, retinal cases, oscillate more violently in the dark. In the one case the light over-stimulates or dazzles, in the other the greatest amount of light and definition possible is required to produce steady vision.

Nystagmus is often worse with fatigue, either of the eye or general; in babies the movements are often less jerky after sleep.

Head Movements.—The tremors of the head so often seen are to be distinguished from the semi-voluntary head movements of spasmus nutans. They are very small and jerky, and are thought to be compensatory to the nystagmus of the eyes. Without a graphic record of the two movements simultaneously I do not think it possible to settle this question.

Physiological Nystagmus.—If you look from the window of a rapidly moving train at objects on the bank your eyes will appear to be in constant movement to another person, because of the rapid passage of the sight from one object to another; if now you look at something fixed in the carriage, it will appear to have movement in a direction opposite to that of the bank of the railway, and will be accompanied by a rolling of the eyes also in a direction opposite to the original movement of watching. The same phenomenon will be observed on looking at water flowing under a bridge; on looking at the bank this will seem to be flowing in an opposite direction, a negative after-movement, accompanied by a negative after-movement of the eyes. This was brought out very clearly on a very dark night last autumn, when I was walking along the coast in Norfolk with my friend Mr. Foster Moore. I had to watch very carefully the edge of the cliff on the one side, and he had to watch the edge of a ditch on the other. After about two miles of this rather perilous walk we came upon the house with a light in one of the windows. I at once noticed that this light sailed up and out to sea quite smoothly—it seemed weird and unaccountable, and I called my friend's attention to it: He at once said, "Oh, yes! I see it, but it's moving inland." We had been looking at different sides, and consequently the rapid movements of our eyes had been opposite; the negative after-movements of objects that we saw were opposite also; and I have no doubt that there was a movement of oscillation in our eyes opposite in direction also. I find that this negative after-movement of objects is well known among motor-drivers. Here we have, then, what is really a *physiological* nystagmus.

Another form of *physiological* oscillation of the eyes, which can be demonstrated, is to urge the eyes to take up the extreme limit of movement in one direction; at the time when the effort is greatest it is accompanied by an extremely rapid oscillation of the eyes, generally at right angles to the line of the intended movement, that is, in looking to the extreme right the movement of oscillation will generally be vertical. Again, if an attempt be made by the fingers to open the tightly closed lids of a resisting person, a very rapid oscillation of the eyes, generally vertical in direction, can sometimes be obtained.

Voluntary Nystagmus.—Many cases have been described of persons who could make their eyes oscillate at will. Williams, in the *Ophthalmic Hospital Reports*, vol. v, describes a man who could produce rapid oscillating movements *in any direction* at will. Work Dodd, Lawson, Raehlmann, Elliott, and Stirling, describe cases, while Granville Waddy collects seven cases, and adds one in which a man, in addition to being able to produce a left-eyed (only) horizontal nystagmus, could also at will inhibit his sphincter pupillæ and his right internal rectus muscle. These people seemed to have acquired the power in youth, they did it without much effort or strain, although it sometimes produced a headache; in some of them there was a sense of movement of objects during the oscillations.

Causes.—When a child is born the eyes move independently and wander about, till something, such as a light, attracts the sight; the image approaches the fovea and becomes more defined, and when it reaches the fovea becomes sharply defined and clear to the normal eye: the muscles and visual centres quickly co-ordinate themselves, so that without any conscious effort the child can bring the image of the object on to the fovea at once. Further, all the movements of the eyes become co-ordinated, although to do this many muscles whose actions are not the same in the two eyes are brought into simultaneous use. For this purpose the requirements are—the formation of a sharp image on the retina, clear optical media, and a refraction not very abnormal; the retina itself must be healthy, and must be possessed of normal pigmentation to absorb an excess of light or harmful reflections; there must be a proper conductivity through the optic nerve, and a normal visual centre in the brain. There is also required a proper development and innervation of the muscles which move the eyes. Of these requirements probably the most important is the formation of a clear image on the retina. If any of these parts be defective the image is not brought sharply up to the fovea, the eye wanders slightly and vaguely about the point of fixation, and there is no proper fixation. The proper action of the co-ordinating centre of muscular action requires the stimulus of exact retinal images; without proper retinal stimulation fixation is imperfect. Why the imperfect fixation shows itself more in one set of muscles than in another is not known, but may be due to some want of balance between one set of muscles and its opponents. As Gowers has pointed out, the activity of the centres that produce the primary movement induces a slighter coincident activity of the opponents, which lasts a little longer than the primary movement and produces a return movement.

Among the actual causes which produce imperfect images, the most frequent are the consequences of ophthalmia neonatorum, leukomata, anterior synechia, pyramidal cataract; and congenital cataract. Probably also there is a certain time within which complete co-ordination can be obtained, and if that time is passed or much encroached upon there is a danger of imperfect fixation becoming permanent. Accordingly we see children not infrequently with nystagmus and a history of ophthalmia with a long period of closure of the eyes after birth, but without any great damage to the ocular media; the failure of use of the eyes in the early days of life itself leads to imperfection in the development of the visual centre and consequently of the co-ordinating centres of the muscles moving the eyes. These children remain amblyopic and have oscillating eyes. The same is true of congenital cataract; if it is not removed very early the sight never becomes very good. That this want of development of the visual and co-ordinating centres is due to a want of use during the early stages of life is shown by the fact that leukomata or cataract acquired in after-life do not lead to amblyopia or nystagmus. Other causes of nystagmus are degeneration of the retina and optic nerve, like early retinitis pigmentosa, infantile syphilitic retinitis, choroiditis affecting the macular area, and extreme myopia with central thinning and atrophy of the choroid.

The effect of errors in refraction has not been quite proved as a cause of nystagmus, but a very high degree of astigmatism gives very imperfect foveal images, and it is certain that the correction of errors of refraction does lead to the reduction of the turbulence of a nystagmus and is sometimes followed by its disappearance. A very large number of nystagmics have considerable errors in refraction, practically all of the pigmentary group. Another large group consists of those with a strongly marked convergent squint following a fit or some cerebral attack, a weakened external rectus, with considerable error in refraction and with very jerky fixation, the rapid movements being towards the weak external rectus. In others there is a bilateral weakness of abduction, also associated with refractive error. The refractive error is always greatest in the eye with the weakest abduction; it is nearly always hypermetropic and astigmatic. The association of a high refractive error with defects in muscular tension in the eye raises the question of how far is the former due to the latter. The almost universal association of albinotic eyes with error of a generally hypermetropic kind also raises the question of how far the abnormal muscular action to which albinotic eyes are subject may conduce to the under-development as regards refraction of these eyes.

The pigmentary group consists of albinos and persons with a greater or less want of general or local pigment. The nystagmus is due to congenital amblyopia from lack of ocular pigment. As concerns the eye, the defective pigmentation may vary in degree or in the parts affected: for instance, there may be no pigment at all in the iris, giving a pink eye; there may be pigment in the retinal layer, giving a blue eye; there may be no pigment in the retinal layer, but sufficient in the iris stroma to give the iris a brown colour, the iris remaining translucent; there may be a general or partial defect, the choroidal pigmentation giving a very pale fundus. But the belief at present is that the pigment that really matters is that of the retinal epithelium, and this may vary in degree or may be absent over a part of the retina. This condition cannot be recognized by the ophthalmoscope, because the choroid behind it may be fully pigmented. Proof of this local absence of retinal pigment is given by the reports of albinotic eyes of animals by Coats and Usher. In some of the family cases of this group certain members have very fair hair, are almost albinotic in their general colouring, and have oscillating eyes; and others have apparent full pigmentation, with dark brown hair and brown irides, but with the same oscillation. To explain such cases it is necessary to assume that, while there is no defect in the general pigmentation of the body or eye, there is yet defect in the pigment of the retinal epithelium.

Hereditary Nystagmus.—This group of cases may be allied to the last one. It contains persons who are noticed to have oscillating eyes soon after birth, associated with amblyopia, but with no signs of retinal or choroidal disease or defect. Until a pathological examination of such eyes has been made, it is impossible to say whether these are to be explained by defect of the retinal epithelium or not. In some cases there is little defect in visual acuteness.

Day-blindness.—In these rare cases there is a certain amount of amblyopia and colour defect, and occasionally some nystagmus; the pathological condition of the retina here is not known.

Occupation Nystagmus.—A great deal has been written about miners' nystagmus both in this country and abroad, and a controversy has arisen between those who held that the position of the miner and consequent fatigue of the eye muscles produced the nystagmus, and those who held that imperfect illumination and bad fixation were the cause of it. This part of the subject has been placed in able hands, and I will only say that the weight of the evidence is on the side of bad fixation as the primary cause. Mr. Snell was the strong advocate of the muscular fatigue theory; he thought it due to a strain of the elevators, and brought forward examples in other trades of nystagmus induced by strain of the elevator muscles. He cites the case of Michael Angelo, who, after painting the ceiling of the Sistine Chapel, lost for a time the power of reading, except when he held the paper over his head; by this he seems to have held the paper in the worst possible place. Among other trade cases there were that of a bottom sawyer, a compositor, sanitary pipe maker, metal roller, platelayer, saw maker, confectioner, ironfounder, fitter, cage worker, and tool sharpener. With the exception of the compositor's, these were isolated cases, and even if the nystagmus could have been shown to arise in consequence of the work, one case could not condemn a trade as a cause of nystagmus. With compositors, however, fatigue of the eyes is a common complaint, many cases of nystagmus have been reported, and it seems as likely that the nystagmus is due to the difficulty of seeing the type—that is, to imperfect retinal images—as that it is due to the strain of the elevator muscles of the eyes. Snell also mentions the Academy headache; this headache is probably a fatigue of the elevators, but no one has yet been found so devoted to the Royal Academy as to acquire nystagmus from his devotion.

Spasmus nutans has been known to most of us since Haddon first called attention to it; it has been observed since then very carefully by Hancock. The movements begin generally about the fourth month, and disappear before the end of the third year, but cases have been reported beginning as early as the sixth week and as late as the third year; it is more common in females. The head movements precede the nystagmus by a few weeks, and also disappear before it. The oscillations are small and rapid, and either horizontal, vertical, or rotatory; they are generally the same in both eyes, but not always, and may be one-eyed. The head movements are slow, and may be vertical (assent movement), rotatory (dissent), or lateral. They bear no relation to the ocular movements, and are to be distinguished from the fine head movements which often attend the eye movements. In discussing the cause, he shows that defective illumination is not a constant factor. He mentions the vestibular theory, and inclines to the view of Haddon, that it is due to an instability of the motor centres above the nuclei in the spinal cord, together with a disturbance of the cerebral cortex.

Myoclonic Nystagmus.—This syndrome, described by Lenoble and Aubineau in the *Revue de Médecine*, 1911,[1] consists of a nystagmus affecting several generations associated with spasmodic movements of the head and body, quivering of muscles, increase of knee-jerks, &c. It is common in Lower Brittany, and may be accompanied by mental or physical degeneration.

Injury.—Mr. Jameson Evans, in the *Ophthalmoscope*,[2] describes two cases of nystagmus following injury to the head. A child fell and struck the right side of his forehead; circumduction nystagmus was at once noticed in one eye, with occasional slight oscillation in the other. Another case he describes is that of a miner, who fell down a shaft. He noticed afterwards that everything was on the move, and he had rotatory nystagmus. It is worthy of note that he had been working as a miner for sixteen years with a safety lamp. This effect of an injury in bringing out a latent nystagmus was shown in a case of my own, in which a boy, aged 2 years 1 month, who had passed through an attack of spasmus nutans, with vertical head movements and small, rapid horizontal nystagmus, made a complete recovery, and had lost both head and eye movements. He fell and struck his head; the nystagmus at once returned, but the movements were much coarser.

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[1] *Rev. de Méd.*, Par., 1911, xxxi, pp. 209-57.

[2] *Ophthalmoscope*, 1910, viii, p. 82.

Toxic Causes.—I cannot find any mention of these, but I have had described to me a case of nystagmus caused by over-use of coffee, which disappeared with the change of drink. I have also seen cases in which unsteadiness of fixation was increased by alcohol and tobacco used to excess.

Dr. James Taylor: Gowers has defined nystagmus as an oscillation of one or usually both eyeballs due to an alternating activity of the opposing muscles. The movement may be regular or irregular. It is usually horizontal, but may be vertical or rotatory. It is usually evoked on voluntary movement, but may be present when the eyeballs are supposed to be at rest. This is especially true of the form which occurs in the first year of life—often associated with head movements—and of this nystagmus it may be said that it usually disappears and is not succeeded by any ocular or visual defect.

Nystagmus, from this simple definition, obviously depends upon some disturbance of the mechanism which carries out, controls, or regulates ocular movements, and as it is associated not only with ocular and visual defects, but also with labyrinthine disease, and occurs in connexion with various diseased conditions of the nervous system, it will be well to indicate the connexion of the ocular mechanism with the labyrinth and with certain parts of the nervous system. The labyrinth is to be regarded as a peripheral sense organ, and the path by which its impressions are conveyed is the vestibular nerve. This takes its origin in the ganglion vestibulare. It supplies its peripheral filaments to the semicircular canals, and it enters the pons between the ascending root of the fifth nerve and the restiform body. We need not trace all its connexions. For our purpose it is sufficient to note that it does form connexions with the nuclei of Deiters and Bechterew, which are generally acknowledged to have connexions with the oculo-motor nuclei, and besides a direct path has been traced from this nerve to the nucleus of the sixth nerve. This brief note as to the anatomical relations also indicates the intimate connexions of the cerebellum with the oculo-motor nuclei.

With regard to diseased conditions of the nervous system associated with nystagmus, there seems to be little doubt that lesions of the cerebral hemispheres do not result in disturbance of the mechanism which controls the eye movement in such a way as to give rise to nystagmus. Even in cases in which irritation of the cortex is present, such as cause deviation of the head and eyes to the opposite side, nystagmus does not occur. It is most probable, as Gowers has suggested, that it is evoked by disturbance of some co-ordinating mechanism situated in close relationship to the mid-brain, pons, and cerebellum—what he calls a mid-brain ocular centre. An interesting question remains—viz., How does this alternating activity of the ocular muscles arise? We are all familiar with the tremor arising on voluntary movement in cases of disseminated sclerosis, and there seems good reason for regarding nystagmus as analogous to this in the cases in which it arises on voluntary movement of the eyes. In both conditions the volitional impulse is normal, but it must be supposed to impinge on structures which are deranged in function, and consequently the muscle reflex action becomes insubordinate, and alternate activity of antagonistic groups of muscles is evoked, instead of the sustained activity of one group. Such alternating activity is, as Gowers pointed out, probably analogous to that obtained by Sherrington in the flexors and extensors of a joint of the lower limb in an animal which has had its spinal cord completely divided in the cervical region. Such alternate action apparently depends upon the action of a spinal centre followed by its inhibition from the centre subserving the opposing muscles, which is excited to action by the stretching of these opponents, these opponents themselves being thrown into contraction at the same time. If this view is correct it would seem to follow that when nystagmus occurs in connexion with muscular action this alternating activity is the result of some impairment of function of structures lower than the hemispheres —either such a co-ordination centre as has been postulated or some peripheral nerve, or even a muscle.

I should now like to consider briefly some forms of nervous disease in which nystagmus is of significance and importance. In disseminated sclerosis, as has been mentioned, it is of frequent occurrence. But it is by no means invariable, and its absence is probably connected with the absence of morbid change in the region in which the ocular movements are co-ordinated and controlled, or in structures connected with this. In Friedreich's ataxy nystagmus is, in my experience, very common, although also not constant. It is not as a rule very striking, and I have never seen it spontaneous, only evoked on voluntary movement. The characteristic lesion in Friedreich's ataxy is disease of the spino-cerebellar system, and as this has communications with Deiters's nucleus, which we have seen has connexion with the ocular nuclei, we may assume that in the case of Friedreich's ataxy, in which nystagmus is present, it is probably to be accounted for in this way.

Syringomyelia is one of the diseases in which nystagmus is exceedingly common, and when one remembers that even in cases in which no definite ocular palsy exists there are often signs and symptoms indicating the presence of glial tissue in the fourth ventricle and round the aqueduct of Sylvius, it will be seen that the occurrence of nystagmus is not only possible but probable.

In disease of the cerebellum nystagmus is common, and it is characteristic in unilateral lesions—tumour, abscess, &c. Risien Russell has pointed out that in cases of unilateral ablation of the cerebellum in animals, coarse slow jerks occur when the eyes are directed to the side of the lesion, and more rapid jerks, smaller in range, occur when the deviation is from the side of the lesion. This has been confirmed by the clinical observations of Russell himself and others in cases of tumour or abscess of one side of the cerebellum.

In most cases of chronic cerebellar degeneration or acute cerebellar inflammation nystagmus is present, but it is not invariable, and this is capable of explanation according as the structures already alluded to are involved in the disease or not.

There is no doubt also that nystagmus occurs in local lesions in the vicinity of Deiters's nucleus, such as thrombosis of posterior inferior cerebellar artery, and conditions of polio-encephalitis. I have also seen well-marked coarse slow nystagmus in a case of amyotrophic lateral sclerosis with bulbar paralysis. In this case the cells of the ocular nuclei were subsequently found to be undergoing degenerative changes similar to those affecting the cells of the bulbar nuclei, and I have noticed also, but rarely, similar nystagmus in cases of tabes dorsalis, in which there was evident interference with the cells of the ocular muscles.

But besides the central motor mechanism the peripheral nervous mechanism for ocular movements may suffer in such a way as to cause nystagmus. It is many years since this fact was impressed upon me by Dr. Thomas Buzzard when I was his house physician. I had read to him in my notes of one of his cases of alcoholic neuritis that there was well-marked nystagmus present, and I had asked him the reason of this. He told me that he had noticed it frequently, and since then I have always looked for it and usually found it. Sometimes no doubt it is slight, but in the particular case I have mentioned it was just as well marked as if the case had been one of disseminated sclerosis. And yet I cannot help thinking that in such cases we probably have to deal with a condition of neuritis affecting the oculo-motor nerves, although, of course, the change may be a central one. I do not know of any post-mortem observations.

The muscles themselves may be the cause of nystagmus—as in cases of myasthenia gravis, for in cases of that strange disorder movements of the eyeballs (quite properly termed nystagmoid, if not nystagmus) are frequently met with.

I should like to refer for one moment to the expression I have used —viz., nystagmoid jerkings. It is a term in common clinical use and it is convenient as indicating that the jerks are not of the vigorous definite kind to which the term "nystagmus" is most properly allotted. Yet I have some doubt whether—at least in neurological cases—there exists a real distinction between those two varieties of clonic eye movement. I know that in the same case of disseminated sclerosis I have seen what were at first described as nystagmoid jerkings develop into a phenomenon which all would acknowledge to be true nystagmus, and I have seen the same thing happen in cases of alcoholic neuritis. It is, of course, conceivable that nystagmoid jerkings may be the result of changes only in peripheral structures, and that the condition becomes a more definite one when the central mechanism becomes involved.

One other thing I might ask in conclusion, and that is, will this view of the causation of nystagmus help us to explain the nystagmus associated with visual conditions? Personally, I am of opinion that it may, but I think that any attempt to do this here and now would expose me to the charge that I was trespassing on a part of this subject which more strictly belongs to the ophthalmic surgeon.

(The Discussion was adjourned until March 4.)

Sections of Neurology, Ophthalmology, and Otology.

COMBINED MEETING.

March 4, 1914.

Sir ANDERSON CRITCHETT, Bt., C.V.O., President of the Section of Ophthalmology, in the Chair.

DISCUSSION ON NYSTAGMUS.[1]

MR. SYDNEY SCOTT: The occasion does not permit of a studied and formal reference to the many recent researches into our subject for discussion, but I venture to hope that there are those present to-night who will take the opportunity of bringing forward the chief results of investigations undertaken by Abrahams, Bartels, Buys, Coppez, Hennebert, Pike, Wilson and others.

NOMENCLATURE.

We shall use the term "nystagmus" to indicate involuntary oscillatory movements of the eyeballs, from whatever cause. By the expression "undulatory nystagmus" we shall understand that the velocity of excursive movement is equal to and fro. The term "rhythmic nystagmus" will be reserved for the form of nystagmus in which the alternate movements are relatively fast in one direction and relatively slow in the other. We shall have to distinguish horizontal, vertical and rotatory nystagmus, the directional character having a particular significance in otology. Nystagmus is said to be horizontal or vertical when the oscillations are in the normal horizontal or vertical planes of the orbit respectively. Rotatory nystagmus is more conveniently described as the oscillatory motion about the anteroposterior axis of the eyeball itself.

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[1] Adjourned from February 26.

Labyrinthine Nystagmus.—The association of certain forms of nystagmus with labyrinthine stimuli justifies the use of the term "labyrinthine nystagmus." Labyrinthine nystagmus is nearly always rhythmic, having alternate slow and fast components. The fast movement is the secondary component, and becomes more intense as the visual axes deviate or rotate axially away from the direction of the slow or primary component. It is the secondary or rapid component which serves to designate the type of nystagmus, thus "horizontal nystagmus to the right" means that the fast horizontal (secondary) component becomes more evident when the eyeballs are deviated towards the right of the orbit. Similarly "vertical nystagmus upwards" will mean that the fast vertical movement becomes more pronounced as the upper meridian of the eyeball is turned upwards towards the roof of the orbit. Rotatory nystagmus to the right or to the left is similarly explained, according to the directions taken by the upper meridian of the eyeball.

INDUCED NYSTAGMUS.

Rhythmic nystagmus can be produced in the normal healthy subject by applying certain excessive stimuli to the semicircular canals, for instance—(1) by rapid rotation, (2) by irrigating the ear for a few minutes with hot or cold water, or (3) by passing a galvanic current through the head (usually 5 to 10 ma.). In each case the nystagmus produced is a normal expression of an *excessive* stimulation of the vestibular nerve. Precisely the same kind of nystagmus can be set up in patients who are suffering or have suffered from middle-ear disease, when the local conditions permit the local application of a suitable stimulus.

ANATOMICAL CONSIDERATIONS.

It will be useful to recall the arrangement of the semicircular canals, for it has long been established by the works of Flourens, Breuer, Mach, Ewald and many others that the phenomena produced by rotation, compression, and caloric stimulation are due to the action of the semicircular canals of the internal ear.

There are three pairs of semicircular canals, one pair being horizontal and two pairs vertical. Each vertical canal occupies a plane which is intermediate between the coronal and sagittal planes of the head. The two anterior or superior canals occupy planes which form an obtuse angle of rather more than 90° opening forwards. The two posterior or inferior canals are in planes which form an angle of rather less than 90°, the angle opening backwards. Topographically, each set of canals is situated in the mid-coronal plane of the skull, in the densest part of the petrous bone, about 3 or 4 cm. from the side of the foramen magnum. It is noteworthy that the seventh, eighth, ninth, tenth, eleventh, and twelfth pairs of cranial nerves leave the cranium in the mid-coronal plane. The ponto-cerebellar recess and the lateral recess of the fourth ventricle, the medulla and the jugular bulb occupy the same plane which corresponds externally to the posterior wall of the external auditory meatus. Although supplied by the eighth or auditory nerve, the fibres destined for the vestibule and semicircular canals form a separate bundle developmentally distinct from the cochlear division of the auditory nerve.

Dr. James Taylor has dealt with the nuclei and distribution of the projection fibres of the vestibular nerve.

It is perhaps well to remark that normal or what one may speak of as everyday movements of the head suffice to stimulate the semicircular canals, setting up afferent impulses which are transmitted to the basal nuclei, and so forth, and reflexly influence the coördination of muscular movements, *not only of the eyes but of other parts of the body.* The ocular movements known as nystagmus are in most cases with which we are concerned in otology due to *excessive* stimuli applied to physiologically normal vestibular systems. When we meet with spontaneous nystagmus we have to consider the relation between the spontaneous and induced nystagmus. We shall first devote attention to induced nystagmus in so far as the ear is concerned.

Nystagmus produced by Syringing the Ear.

Irrigation of one ear with hot water when the head is erect will produce involuntary pleurothotonus towards the contra-lateral side, with rhythmic rotatory nystagmus towards the ipsi-lateral side. The direction of these reflex movements is reversed by keeping the head inverted during the progress of irrigation, and they can also be reversed by using cold water instead of hot, without inverting the head. The legitimate explanation is that, in accordance with the laws of heat, convection currents are set up in the endolymph, and that the direction of these currents determines the direction of the reflex movements. When the head is erect or inverted the currents would be induced in the superior semicircular canal, and this would account for the rotatory nystagmus. When the individual under examination lies with face upwards when the ear is irrigated with hot water, he will tend to roll towards the contra-lateral side, and horizontal rhythmic nystagmus will be noticed towards the ipsi-lateral side. If we use cold water instead of hot, the face remaining uppermost, the direction of the forced movements will be reversed. We can also reverse the direction of the movements by placing the head with face downwards during the procedure of irrigation with hot water, and again reversal of the direction of the reflex movements may be induced by employing cold water instead of hot, while the face remains prone. These data cannot be collected in one sitting in the same patient, but they represent the results of many observations at different times. In the Arris and Gale Lecture for 1910 I ventured to express the reactions in the form of a law based upon the convection hypothesis: "*The deviation of the head and eyes is in the same direction as the current in the endolymph, and the nystagmus is in the opposite direction.*"

NYSTAGMUS PRODUCED BY ROTATION.

The phenomena produced by rotation tests are in harmony with those produced by the caloric tests, and are explicable by the laws of inertia and the production of currents in the endolymph.

Stimulation of the Horizontal Canals.—As is well known, after an individual is actively or passively rotated with head erect, several times, a sudden arrest of rotation sets up horizontal rhythmic nystagmus, the direction of the nystagmus being opposite to that of the previous rotation. When the eyeballs are voluntarily turned fully towards the direction of rotation the nystagmus momentarily ceases, and is resumed when the axes are deviated the other way. In this case the horizontal canals are affected.

Stimulation of the Superior Canals.—When the head is bowed forward during the rotation, the superior semicircular canals are affected and the resulting nystagmus is rotatory.

Stimulation of the Posterior Canals.—When the head is placed in the lateral posture, vertical nystagmus is evoked, also opisthotonos or emprosthotonos. One should take this opportunity to emphasize that these eye movements are of secondary importance compared with the

the primary movements of the head, trunk and limbs, which result from rotation stimuli, and that by attending only to the nystagmus we are studying only part of the reflex movements produced by labyrinthine stimulation.

NYSTAGMUS PRODUCED BY GALVANIC STIMULATION.

When the electrodes of a galvanic system are applied to one or both sides of the head, in the former case the one electrode being in a neutral position, a sustained current of 2 to 5 ma. is sufficient to provoke definite reflex movements of the head and trunk, but insufficient to provoke nystagmus. If the strength of the current is increased to 5 or 10 ma., or sometimes 15 ma., rotatory nystagmus will be set up in addition to the forced movements of the head and trunk. This mode of stimulus is occasionally of considerable value. It will be observed that the direction of the nystagmus varies with the position of the electrodes. When the anode is in contact with the head in the region of the ear, and the kathode is in the hand, on the back or on the other side of the head, the nystagmus is directed *away from the anode.* When the position of the electrodes is reversed, the nystagmus is *towards the kathode.* The anodal current gives a stronger stimulus than the kathodal current.

The responses to galvanism are observable in cases in which the labyrinth has been disorganized or removed, but the reactions are absent in cases of destruction of the vestibular nerve by a neoplasm.

NYSTAGMUS PRODUCED BY MEATAL COMPRESSION.

Nystagmus can also be momentarily provoked occasionally in patients who have middle-ear disease associated with a fistulous communication between the middle and internal ears, by sudden compression of the meatal contents, provided the neuro-epithelium of the vestibular nerve is intact and that the local condition remains favourable for the transmission of sudden changes of pressure to the interior of the labyrinth.

Dr. Hughlings Jackson's Case, "Fistel-symptom."—It is now about thirty-five years ago since Hughlings Jackson described examples of nystagmus in association with ear disease. Schwabach in Germany, Blake, and later Kipp in America, also described cases about the same time. Hughlings Jackson case was that of a woman, aged 49, with suppurative disease of the ear. Digital compression of the meatal contents caused immediate giddiness, which was associated with deviation movements of the eyeballs towards the contra-lateral side. Rhythmic nystagmus followed, with the rapid component towards the ipsi-lateral side; some rotatory movement was also noticeable. Dr. Jackson did not have the opportunity of verifying the existence of a labyrinthine fistula, but there can be little doubt that one did exist. The term "fistel-symptom" is now employed to designate the phenomena resulting from meatal compression which Jackson described. During a period of about ten years I have met with only twenty-three examples of the "fistel-symptom," but in nearly every case an opportunity occurred of verifying the actual existence of a fistula which generally led into the external semicircular canal.

Many cases of labyrinthine fistulæ occur, of course, without being associated with the "fistel-symptom," simply because the internal ear has already become disorganized and ceased to react, or because the fistula may be protected by epithelial accumulations which hinder the transmission of sudden changes of pressure from the middle to the internal ear, although the latter may retain its normal sensibility. Rarely the "fistel-symptom" may appear about a month after the mastoid operation has been performed for chronic suppuration of the middle ear. At the time of the operation the semicircular canals and the vestibular walls may be quite intact, and it would seem that the sign develops with the appearance of vascular granulations upon the outer wall of the labyrinth. The gentlest possible application of a probe, in such cases, to the granular area over the external semicircular canal immediately provokes the nystagmus and also a sudden jerking movement of the head. It is several weeks before the sign disappears, and I have little doubt it arises from the formation of porous bone during the growth of granulations from the thin outer wall of the external semicircular canal. The "fistel-reflex-symptom" is remarkably characteristic. It can be provoked not only with the probe but by means of a Politzer bag, connected with the external auditory meatus, with a rubber tube which accurately fits the meatus. The apparatus known as Seigel's or Peters's speculum will serve the same purpose. Sudden slight compression of the rubber bulb, when the patient is seated erect, causes the head to be suddenly and involuntarily jerked about a vertical axis, the face turning away from the stimulated side; simultaneously the eyeballs rotate in the orbits in the same direction as the head. The ocular movements are more sensitive to the pressure than the head movements, so by carefully regulating the compression one may evoke ocular movements without head movements. It will then be seen that each compression causes the eyeballs to oscillate horizontally. A very slight stimulus may cause undulatory horizontal nystagmus, a stronger compression will set up rhythmic horizontal nystagmus, and a still slightly stronger compression will introduce a rotatory element, so that we obtain combined horizontal and rotatory nystagmus. In each case the nystagmus is quite transient, lasting only a few seconds. It is accompanied by the unpleasant sensations of dizziness, and a word of warning will perhaps not be misplaced, for unless the test is very carefully applied there is a possibility of forcing pus into the labyrinth and setting up diffuse labyrinthitis and risks of meningitis. It will be understood therefore that one should be extremely cautious in the application of the test for the "fistel-symptom."

KINEMATOGRAPHY OF NYSTAGMUS.

Dr. Adolphe Abrahams's series of kinematographs included one of my patients in whom the nystagmus, provoked by meatal compression, was undulatory. An elaborate study of the photographs showed that there was no difference in the rate of the movement of the eyeball to either side, and in each application of the test the primary movement was away from the side stimulated. In other examples which Dr. Abrahams examined by the same means it was found that the proportionate rate of primary and secondary motions was approximately as five to three, and this constitutes the rhythm of spontaneous labyrinthine nystagmus.

In considering the relation of the two components in labyrinthine nystagmus it is important to notice that the rapid or secondary component is abolished by general anæsthesia. One sometimes has the opportunity of observing the effect of direct pressure upon a semicircular canal fistula when operating for disease of the ear. If the labyrinth is active the eyeball moves in response to the pressure, not in an oscillatory manner, but by simply deviating to one side. Sometimes one may evoke alternate deviation movements by applying pressure alternately to a semicircular canal fistula and to the fenestra ovalis. In a case which Mr. Tilley witnessed one was able to provoke at will alternate movements of the eyeball away from the stimulus when the probe was applied to the canal, and a movement towards the stimulus when the probe was applied to the stapedial fossa. One regards such alternate movements as being two separate primary reflex movements, the secondary reflexes being in abeyance so long as the patient is anæsthetized.

SPONTANEOUS NYSTAGMUS.

Spontaneous nystagmus is frequently observed both in individuals who are in good health and in those affected by general diseases, when the muscles are strained by maintaining the visual axes in a position of extreme lateral deviation. Dr. Selborne Bailey tested 500 individuals, amongst whom nystagmus was observable in 20 per cent. The type of nystagmus in the great majority of these cases was rhythmic rotatory toward the side of deviation, and was not observable unless the visual axes deviated beyond the field of binocular vision.

We should particularly notice that this common non-pathological form of nystagmus, which we conveniently, though arbitrarily, exclude from further consideration, is bilateral and symmetrical in kind and degree.

In discussing labyrinthine nystagmus, and comparing it with nystagmus associated with disease of the central nervous system, or of the eye itself, we invariably concentrate our observations on nystagmus which occurs within the binocular field.

Spontaneous labyrinthine nystagmus resembles induced nystagmus in kind and degree, being always asymmetrical, binocular and generally unilateral in direction. Spontaneous labyrinthine nystagmus is always rhythmic, and usually finely horizontal or rotatory in type. Rarely it is rotatory to one side and oblique, that is, combined horizontal, and vertical to the other. The less intense forms are sometimes seen in cases of acute or chronic otitis media. If the infection does not spread to and destroy the labyrinth, the nystagmus is restricted to the side of the infection. The nystagmus in these cases is usually transient, and may be overlooked. The complaint of giddiness leads one to look diligently for sustained nystagmus, although giddiness is experienced more frequently than nystagmus can be recognized. If one applies the tests for inducing nystagmus to such a case, the labyrinth in question appears to be hypersensitive. The existing nystagmus can be temporarily abolished or intensified, according to the test, more easily when the stimuli are applied to the affected ear than when applied to the other side.

Spontaneous rhythmic rotatory nystagmus to one side is also met with when the opposite labyrinth has become functionless. This form of nystagmus develops the moment the one labyrinth is destroyed, but disappears when both labyrinths become defunct. It does not usually occur in young children, and Sir Victor Horsley has pointed out its absence or very early disappearance in monkeys. In the adult human being this contralateral nystagmus is an invariable sign of unilateral ablation, and can be observed, if sought for, several weeks, months or sometimes years after the onset. It certainly tends to become less intense as time goes on, but is liable to be renewed in intensity temporarily whenever the patient's general health fails. In a few instances contralateral nystagmus, due to ablation of one labyrinth, is accompanied by a fine horizontal nystagmus toward the defunct side. Dr. James Taylor has pointed out the importance of observing well-marked nystagmus toward the diseased side with fine nystagmus to the contra-lateral side in cases of cerebellar tumour, and we should remember that the same sign is observed in cases of cerebellar or extra-cerebellar abscess, which generally arise from an infection of the middle or internal ear.

LABYRINTHINE NYSTAGMUS IN CASES OF ABSOLUTE BLINDNESS.

When the labyrinth is stimulated in cases of total blindness, due to a local cause, such as primary optic atrophy, and when the blindness is not accompanied by intracranial disease, rhythmic nystagmus can be provoked by rotation or irrigation in the usual way, but the primary component comes into greater prominence as the eyeball aimlessly deviates or rolls to one side in response to the labyrinthine stimulus. In the absence of retinal stimuli the patient is directed to look towards his own hand, which is passively held to the right or left as desired, and we shall then notice that the oculo-motor effort to deviate the ocular axes at once induces true rhythmic nystagmus, having characters similar to those met with in patients with normal vision subjected to the same tests.

THE EFFECT OF CAROTID COMPRESSION.

We have noticed in some cases with one labyrinth defunct that spontaneous nystagmus can be arrested by digital compression upon the carotid sheath of the normal side, sufficient to arrest the pulsation of the superficial temporal arteries. I have also repeatedly observed in an elderly patient who had lost the function of one labyrinth in early life, that carotid compression on the normal side could evoke nystagmus. I cannot say, however, that we have arrived at the correct explanation of this phenomenon, nor have I found the observation to be of clinical value at present.

METHODS OF MEASURING THE STRENGTH OF THE STIMULUS AND THE INTENSITY OF THE NYSTAGMUS.

It is sometimes found that nystagmus can be more easily produced by stimulating one ear than by stimulating the other. Just as the knee-jerks are described as being equally or unequally brisk, sluggish, or abolished, so may we describe the labyrinthine reflexes as being equally brisk, sluggish, or abolished. It is difficult to choose a criterion for briskness and sluggishness, and so to a great extent we have been satisfied by concluding that the labyrinthine reflexes are either present or absent. There is a possibility of estimating and recording degrees of activity by elaborating the following methods:—

Rotation.—(1) Employing a constant stimulus; that is, constant rate and number of rotations and noting the duration of the nystagmus which follows the sudden stop. (2) Ascertaining the minimal number of rotations which induce nystagmus.

Caloric Method.—(1) By employing a constant temperature of the thermal agent and observing the period of induction before the onset of nystagmus. (2) By measuring the quantity of the fluid at a constant temperature which flows before nystagmus can be recognized. (3) By noting the extremes of temperature employed to provoke nystagmus.

Galvanic Method.—By observing the current in milliamperes which is required to induce nystagmus.

I shall conclude at this stage with the hope that others will supply the many deficiencies of which I am only too deeply conscious in attempting to open this discussion from the aspect of otology.

DR. LISTER LLEWELLYN: *The Relation of Miners' Nystagmus to General Nystagmus.*—The oscillation of the eyeballs found in miners' nystagmus is only one, although a most important one, of the physical signs and symptoms of the disease in question. Nystagmus in general is but a physical sign found in many conditions. There is at once then a resemblance between the nystagmus of miners and that found in the many and various conditions which may be grouped under the three Sections of Ophthalmology, Otology and Neurology meeting here to night.

In miners' nystagmus the nystagmus itself produces the most marked subjective symptoms, in general nystagmus the movement of the eyes is either not noticed by the patient or plays a very slight rôle in the symptomatology of the disease. In general nystagmus it is the physical sign, in miners' nystagmus it is the symptom which is the important factor. In miners' nystagmus the oscillation of the eyes is of a rotatory character and with few exceptions is equally marked in both eyes. Ohm [12], using an elaborate apparatus, gives a correspondingly elaborate description of ocular movements which are rarely equal and symmetrical. The nystagmus is increased on exertion or by making the patient look up and is generally brought to a standstill when the eyes are directed downwards and converged. In addition to the nystagmus there are irregular movements of the eyeballs, of which the most important is a marked divergence, the eyes rolling upwards and outwards under cover of the upper lids. In general nystagmus the oscillation of the eyes is usually lateral and there is often a distinct difference in the movements of each eye. There may also be a greater frequency of oscillation in looking in one direction.

If the causes of nystagmus are taken under the three headings of neurology, ophthalmology and otology, it will be found that the ætiological factors are paralleled in the nystagmus of miners.

OPHTHALMOLOGICAL FACTORS.

Taking the ophthalmological causes it will be found that the conditions producing nystagmus are those which bring about an indefinite and inexact image on the retina. To take an extreme instance, there is the nystagmus of blindness where no image is formed. In optic atrophy, marked errors of refraction, corneal opacities and other ocular conditions, the nystagmus is due to the indefiniteness of the image. Maddox [7] has shown that even in normal people the eyes move when an absolutely homogeneous field is viewed in the dark. Albinism with its lack of visual definition is always associated with nystagmus, and Nettleship [10] has suggested that many cases of congenital nystagmus are due to a partial albinism of the eyes. Von Nagel [9] and von Kries [6] have suggested that the peripheral and central portions of the retina have different functions and that it is the peripheral portion which is used in dull illumination. This has long been known to astronomers, who sight a star by looking a little to the side of it. In dull illumination then there is a tendency to use the peripheral portion of the retina; peripheral images are not so exact and definite as foveal. Dull illumination then produces inexact images and a tendency to movement of the eyes. Arlt [1] and Edridge-Green [4] suggest that the movements of the eyes are for the purpose of bringing a fresh portion of the retina into play.

In the coal-mine the miner works under very feeble illumination, the surface of the coal is more or less uniform, the floor, roof and all the surroundings are covered with coal-dust, and there is consequently an almost complete lack of colour relief. In short, the conditions which Maddox says will produce ocular movements in a normal person are almost all reproduced in a coal-mine. There is the homogeneous surface which requires to be fixed and the many years' work in dull illumination take the place of the absolute darkness of the laboratory test. The illumination in all coal-mines is low, but some mines are much better lighted than others, and these mines either do not produce nystagmus or have only a few cases. In coal-mines, in addition to the original feeble illumination, there is a further diminution as a result of the absorption of light by the coal. It is hard to realize how much of the effective lighting of a room is due to reflection from the walls and ceiling. Trotter [18] quotes a very interesting example. If lights amounting to one hundred candle-power are placed in a room, the walls, floor and ceiling of which had a reflecting power of 80 per cent., the result would be the same as if lights amounting to five hundred candle-power were placed in a similar room having black walls. Coal will absorb from 86 to 97 per cent. of all incident light. This means that a lamp in a pit will only be equivalent to one of one-fifth of its power in a lightly papered room. The safety lamp has to be placed out of danger of the pick and is often six or more feet away from the coal-face. The light given by a modern oil safety lamp is almost always less than one-half and often not more than one-third of a candle-power. This light falls at an angle on a substance capable of absorbing from 86 to 97 per cent. of all incident rays. The light reaching the coal face may be less than one-hundredth part of a foot-candle; the light which reaches and acts on the retina may only be three per cent. of this amount or three ten-thousandth parts of a foot-candle. From a large number of measurements taken in several safety lamp pits, the average illumination on the whole of the colliers' working place was found to vary from one-fiftieth to one-seventieth of a foot-candle.[1] The average amount of effective illumination reaching the eye would be from a three-thousandth part to a four ten-thousandth part of a foot-candle—a very feeble illumination. The illumination in candle pits was found to be about five times as great as in safety lamp mines. The safety lamp pits throughout the country may be described as hot-beds of the disease. The naked-light pits of South Wales, Somerset, Forest of Dean and South and North Staffordshire are practically free from the disease. In 900 consecutive cases of miners' nystagmus 870 had worked with safety lamps and thirty with candles; of these last thirty cases twenty had at one time or another worked with safety lamps.

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[1] *See* Llewellyn, "Miners' Nystagmus," 1912.

In 1912, 3,195 cases of nystagmus received compensation. This corresponds roughly to one man in every 2,700 employed underground. Why is it that so small a number of men are affected if the conditions of work are similar in all cases? In the first place miners' nystagmus is a disease of gradual onset and the duration of underground life before failure averages twenty-six years. This does not explain everything and there must be a personal factor which will account for the escape of one man and the affliction of another working under similar circumstances. The personal factor which very largely determines the onset of the disease is the presence of refractive error. Romiée [14] first called attention to this, but for some years afterwards no writer produced any statistics on the subject. Lately, however, Tomlin [17], Norman [11], McMurray [8], Folker [5], Wilson [19], and Brown and Mackenzie [2], have pointed out the great importance of the presence of an error of refraction. In the writer's series it was only possible to examine 593 cases, of which 484 or over 81 per cent. were found to have an error of refraction. The most reliable figures, quoted by Parsons, show that refractive errors occur in 70 per cent. of the general public.

There is another personal factor which has not received any notice. The writer observed some years back that several of the most severe cases had fair hair and light-coloured eyes. A note was kept in 887 cases and the results are tabulated below.

	Colour of eyes	Colour of hair	
Blue	423 = 565, or 63·1 per cent. ...	Fair ...	207
Grey	142 ...	Medium ...	332
Light brown ...	81 = 322, or 36·9 ,, ...	Dark ...	325
Dark brown ...	241		

The figures are too few to be conclusive, but may be compared with those obtained from the examination of 648 normal miners.

CONTROL TEST.

	Eyes	Hair	
Blue	142 = 272, or 41·9 per cent. ...	Fair ...	82
Grey	80 ...	Medium ...	216
Light brown ...	118 = 376, or 58·1 ,, ...	Dark ...	350
Dark brown ...	258		

OCULAR STRAIN.

Most of the cases of miners' nystagmus occur in workers at the coal-face and among men who actually get the coal. The coal-hewer is often a very highly trained workman and all the blows he delivers are accurately aimed. This necessitates an appreciable amount of ocular strain, which is shown in the frequent occurrence of congestion of the eyelids and conjunctiva. Many men show convergence of the eyes. The dull illumination, ocular strain and refractive error are three of the most important factors in the production of miners' nystagmus.

OTOLOGICAL FACTORS.

It has been shown by Bárány and others that disturbances of the labyrinth by abnormal mechanical stimulation bring about nystagmus. Some writers, especially Peters [13], have even asked if the nystagmus of miners is of labyrinthine origin. In long-standing cases the head is often thrown back, the eyelids droop and the man looks out at you from half-closed eyelids. In the writer's opinion this position of the head is not primary as suggested by Peters, but secondary and brought about in the following manner. In almost all cases of miners' nystagmus the ocular movements cease when the eyes are converged and depressed, that is, when the eyes are in the position of maximum stability. If the eyes are kept in this position and carried back with the head the man has a wider outlook, and is able to walk about better. His eyes will be still in a relative position of convergence and depression. The school of Snell [16] says that miners' nystagmus is due to the strain produced by the unnatural position of the head and eyes of the coal-getter while holing, a method of winning the coal by undercutting the bottom layers, which is said to necessitate an upward and oblique direction of visual regard. It has been pointed out by Dr. Court [3] and the writer that holing does not necessitate this upward and oblique gaze. In holing the man does not strike the coal above the level of his eyes, he aims at a spot opposite his eyes and moves his position from time to time as required. Holers and coal-getters are affected in a larger proportion than other underground workmen, but no class of miner is exempt from the disease. It occurs in men who look after the horses. In the writer's series over 48 per cent. had done no holing. Holing in open light pits does not produce the disease, as shown by the absence of nystagmus in

Somerset and the Forest of Dean, where all the coal is got by bottom holing. The greater frequency of the disease among coal-getters is due to the fact that they use their eyes more, work in a feebler illumination and are subject to a greater strain than other underground workmen.

Rutten [15] and other observers say that nystagmus is due to the constant alteration of the position of the head and that the eyes move in an opposite direction (*gegenrollung*) to counteract this effect. Work in an unnatural position in a good light does not produce nystagmus, but if the illumination is poor any constrained position which the miner has to assume would act as a secondary factor in the production of the disease.

NEUROLOGICAL FACTORS.

In the disease miners' nystagmus there are in addition to the ocular movements other well marked symptoms and physical signs. The man complains of loss of sight, especially at night-time, of headaches, giddiness and intolerance of light. In marked cases there is often mental depression. The physical signs are, in addition to the movements of the eyes, tremor of the eyelids often accompanied by spasm, tremor of eyebrows, head, and even of the shoulders. These signs indicate an extensive involvement of the nervous system. The ultimate cause of miners' nystagmus is the want of coördination in the centre—the mid-brain ocular centre of Gowers—governing the associated movements of the eyes. This want of coördination is due to the imperfect and inexact impulses arriving from the periphery. Nystagmus is found in many neurological conditions, of which the most common are cerebellar affections and disseminated sclerosis. In the last condition it is easy to imagine a localized sclerosis affecting the mid-brain centre or fibres emanating from that centre. In addition to the involvement of the lower cerebral centres there is in miners' nystagmus a disturbance of the higher or mental centres. Two miners may show to an equal extent the objective signs of the disease, one only may complain of subjective symptoms and be incapacitated. In many cases of nystagmus the mental symptoms are so marked that the patient may be said to be suffering from a superadded neurosis. It is not correct to say that miners' nystagmus is a neurosis, as in most cases there is not the slightest evidence of any neurotic suffering. Any accident to the eye, head, or body, may convert a latent attack of nystagmus into a manifest attack in which the subjective symptoms are marked. Illness, mental shock or excess of alcohol have a similar effect. The result may be brought about by suggestion, and the writer has often seen cases where knowledge of the patient that he has the disease is sufficient to convert a latent into a manifest attack. For example, if a medical man while examining a patient for another cause finds nystagmus and tells his patient, the man will develop subjective symptoms at once. In one case a man who was supposed to have had a fit in the pit was sent for examination by the manager, who asked if it was safe to employ the man underground. The man, who remembered nothing of his attack, said he was quite well, and was anxious to resume work at once. On examination well-marked nystagmus was found, and evidence of commencing general paralysis. The man not being allowed to return to work, went to his doctor, who only discovered the nystagmus, and told the man he could claim compensation. The man immediately developed all the symptoms of the disease.

In conclusion, miners' nystagmus is the result of a large number of factors, neurological, ophthalmological and otological. In the production of the disease the most important factors are dull illumination, ocular strain and refractive error; in the incapacity and suffering caused by the disease the mental factors are of almost equal importance.

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[17] Tomlin. *Med. Chron.*, Manchester, 1911, 4th ser., xxii, p. 17.
[18] Trotter. "Illumination," 1911, p. 24.
[19] Wilson. *Brit. Med. Journ.*, 1913, ii, p. 1150.

Dr. Dan McKenzie: *Vestibular Nystagmus.*—There are one or two points connected with the *physiology* I should like to touch upon. First of all, with regard to the mechanism by which rotation induces nystagmus, I agree with those who hold that the movement of the endolymph in the semicircular canal is never a steady round-and-round circulation. That there must be some movement of the fluid is undoubted, but the movement is that of a wave rather than that of a current—a local rise or fall in fluid pressure.

Arguing from the anatomical conformation of the canal, I suggest that under the ordinary conditions of normal life the rise or fall in endolymphatic pressure in the ampulla, consequent upon the ordinary changes in position of the head, is quickly relieved by the local excess of fluid passing into the finer position of the canal, and so round to its undilated end, and the pressure being thus rapidly equalized an excessive stimulation of the end-organ is avoided. (The process is similar but reversed, of course, in direction in the case of fall in intra-ampullary pressure.) But when, as in continued rotation, this change in pressure is sustained for a time, or when there is a repercussion, so to speak, the finely calibred canal will be incapable of providing a sufficiently rapid relief and excessive stimulation of the nerve-ending will result, with nystagmus, vertigo, &c. This theory necessarily refers the period of equilibrium of eye movements *during* rotation to the exhaustion of the nerve-centre. If the ampulla were a cul-de-sac, then reflux, reverse, and crossed waves would necessarily be set up, which would lead to confused and irregular stimulation of the end-organ. And if, on the other hand, the canal were of equal calibre throughout, nystagmus and vertigo (the end-organ being as it is) would accompany even limited and transitory changes in position of the head. Thus the ampulla may be regarded as a device to favour the reception of small waves, while the rest of the canal provides a method of rapidly equalizing the pressure, and so of calming the oscillation.

Dr. Adam Gray, Registrar at the Central London Throat and Ear Hospital, who has been working at this subject for some time, has drawn our attention to an interesting observation in connexion with Romberg's sign of vestibular disturbance. It is that during a period of vertigo equilibrium may be maintained by the patient firmly pressing the palms of the hands on the occiput with the fingers interlacing. One hand alone has no influence upon the tendency to fall, neither was there any definite result from placing the hands on the sides of the face. Tried upon normal individuals after rotation, the manœuvre was found to have a marked effect in minimizing the tendency to fall. The explanation we imagine to be that in the position assumed, the two hands in contact with the head and with each other reinforce the muscle and tactile senses, upon which, in the absence of the normal vestibular stimuli, equilibrium depends. I am also indebted to Dr. Gray for the notes of four of the cases now reported.

I turn now to the *pathological* aspect of the question, and first of all to the *spontaneous nystagmus* of the "labyrinth storm." In this particular I have only one remark to make, and that is that I agree that the direction of the spontaneous nystagmus should *not* be taken as the faithful guide to the labyrinth that is affected, or as the means of distinguishing acute labyrinthitis from cerebellar abscess. In acute labyrinthitis I have more than once observed spontaneous nystagmus to the affected side, although, of course, in most cases it is directed to the opposite side. Some years ago under the influence of the old view, I once nearly operated for cerebellar abscess upon a patient who was suffering from occipital headache and spontaneous nystagmus to the same side, which had come on after a radical mastoid operation. Fortunately, I held my hand for twenty-four hours, and at the end of that time the nystagmus had become much less marked. The subsequent history of the case showed that we were dealing with a simple post-operative serous labyrinthitis. As Neumann in his book on "Cerebellar Abscess" points out, the real reliable distinction lies in this, that in acute labyrinthitis the nystagmus declines in severity as time goes on, whereas, in cerebellar abscess, the symptom persists unaltered, or it may even become more marked.

In non-suppurative disease of the internal ear I have for several years past been accumulating experiences with regard to the vestibular reactions; and I have drawn up a list of the last thirty-two cases which have been examined by myself, together with four cases investigated by Dr. Adam Gray. Before going into the analysis of the data obtained, I should like once more to emphasize the desirability of employing the vestibular tests in all cases of perceptive deafness, whether mild or severe. By adopting the method of measuring the duration of rotation nystagmus, as Bárány advises, or the method of measuring the duration of the induction period of the caloric test, in the manner I have suggested, or by both of these methods combined with an observation of the phenomenon in general, we are able to detect the presence of slight or moderate interference with the vestibular reflexes, and can often thereby obtain information of considerable moment bearing upon the diagnosis, and even upon the prognosis of our cases. To omit these clinical methods, and in this way to ignore the milder varieties of vestibular impairment, paying no heed to the results unless they show a very considerable interference with vestibular function, is surely an unreasonable attitude to take up. With very little practice one soon becomes sufficiently expert to carry out the test with little or no discomfort to the patient.

The method of measuring the induction period of caloric nystagmus consists in running into the (cleaned) external auditory meatus a gentle stream of water of a temperature of from 22° to 24° C., the time being noted when the water begins to flow and when the nystagmus is first apparent, the slow deviation of the eyes being the first to appear. The patient should be instructed to turn his eyes to the opposite side. Although, naturally, I believe the merits of this method to be considerable, I have no desire to lay special stress upon it, because while it is true that as a rule the length of the induction period varies directly with the activity of the reflex, in a few cases the induction period will be found to be of normal duration (twenty-five to thirty-five seconds), although the excursion of the ocular movements is short and the vertigo trifling or absent. Such cases are, of course, defective, although the induction period is of the normal length. The rule is, however, for a long induction period to be followed by a small nystagmus, and for a short induction period to lead up to a large nystagmus, and to violent vertigo. I cannot remember ever having seen a violent reaction occur when the induction period exceeded forty seconds. But in all cases regard must be had to the general type and degree of intensity of the reactions produced.

With regard now to the findings in the cases I have observed: Let me say to begin with, that, while most of the cases here reported seem plain and straightforward, anomalous results occur every now and again of such a nature as to defy explanation: the caloric may prove to be negative, for example, while the rotation test is positive, or vice versa. But these results are exceedingly rare, and may, for all practical purposes, be ignored.

As can be seen from the tables, an effort has been made to correlate the results of the cochlear tests with those of the vestibular tests. Details of the tests have been replaced by simple terms like "severe," "moderate," "slight," or "trifling," for the sake of clearness, but it may be taken that the numbers in feet and in seconds exist in the original notes. The idea before my mind has been to ascertain, if possible, whether the vestibular tests in cases of perceptive deafness, not due to labyrinth suppuration, are of any reliable value in arriving at a diagnosis of the disease, or in forming a prognosis in so far as the hearing is concerned. It will be seen, I think, that although the point is not yet finally settled—the numbers of cases tested are too few for that—it often happens that the vestibular tests provide us with information not only of interest but also of practical use.

To begin with, out of the thirty-six cases, nineteen showed a correspondence between the loss of hearing and the impairment of the vestibular reflex. Sometimes, it will be observed, minor discrepancies occur—the deafer ear may show a livelier vestibular reaction than the better ear does, or on one side, although the deafness is considerable, the vestibular response may be normal. But, on the whole, the claim that a harmony between the two systems exists, more or less complete, is well substantiated. It is interesting to note that in the two cases of simple noise-deafness, where, one would suppose, the lesion must necessarily be limited to the cochlea (Cases *A*, 9 and 12), the vestibular responses were deficient. It is noteworthy that the same result was recorded in a former publication dealing with an earlier series of cases.[1] Case 11, which is on exhibition to-day, is of interest as bearing out Moure and Cauzard's prophecy that the vestibular tests would be of value in detecting malingering.

The second group of seventeen cases with "Cochlear and Vestibular impairment not in harmony" I have divided up into two classes; first, those in which the hearing was solely or principally affected (five cases with normal, and eight cases with exaggerated vestibular responses), and second, those in which the vestibular system was more affected than the auditory system (four cases).

We shall discuss them in the order in which they come. Of the five cases of nerve-deafness with normal vestibular reactions no fewer than three were proved to be functional and one was suspected of being functional. Case 2 in this group was that of a young woman with very slight nerve-deafness of short duration and normal vestibular reactions, in which it may be supposed that if it should prove to be organic the cochlear lesion was too recent to have spread to involve the vestibule. Of the eight cases of nerve-deafness with exaggerated vestibular reactions, four were almost certainly functional, two were doubtfully functional, one was almost certainly organic (Bright's disease, Case *B*, A, β, 4) and the diagnosis in one was unknown. That is to say, out of these thirteen cases of nerve-deafness with normal or exaggerated vestibular responses, seven were certainly and three were probably functional in character; while in two the diagnosis was that of organic ear disease (one slight, the other moderate, and both of short duration); one case was not diagnosed.

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[1] *Journ. of Laryngology*, 1909, xxiv, p. 646.

That is to say, that these figures, as far as they go, tend to support, with some qualification, the observation I have previously made that the presence of normal or exaggerated vestibular responses is a point in favour of regarding such cases as functional. The qualification to be made consists in this, that organic nerve-deafness if of recent origin may be combined with normal or excessive vestibular responses.

Finally, we come to the group of four cases in which the vestibule was affected more than the cochlea. In two of these cases the hearing was quite normal in one ear; in two, the loss of hearing was only detected by the tuning-fork test; in one, there was severe deafness in one ear and normal hearing (at the time, six months ago) in the other. The later history of this case and of another (Case 4 in this group) with severe unilateral deafness bear out a surmise which we might venture almost to express as a probability, that in a case with good hearing where the vestibular responses are seriously impaired, the likelihood is that the hearing also will in time become seriously affected; a supposition which the large proportion of cases in group A—impairment of both hearing and vestibular sense—tends to support. On the other hand, we may regard as more favourable, cases of nerve-deafness, especially if long continued, where the vestibular reactions are normal or exaggerated, bearing in mind, however, the fact that hysterical or functional deafness, like any other similar manifestation of this disorder, is often obstinate and persistent.

In conclusion, I think we ought to regard the absence or deficiency of vestibular reactions as of more positive value in any given case than their presence, whether normal or exaggerated. With regard to the teaching and understanding of the vestibular symptoms—an admittedly tough subject—clinically speaking, one lays stress upon the vestibular response, as a whole, and ignores the individual canals. I am usually in the habit of giving a clue to the difficulty by saying that "the stimulated labyrinth attracts the nystagmus." This, of course, is open to criticism, but as a rough and easily comprehended dictum it is not to be despised. Thus when after rotation the nystagmus is to the left, we say the left vestibular system is the main source of the stimulus; when with the cold caloric the nystagmus is to the right, the right labyrinth is the main source of stimuli, and so on.

ANALYSIS OF THIRTY-SIX CASES OF PERCEPTIVE DEAFNESS (NON-SUPPURATIVE DISEASE).

(*A*) WITH COCHLEAR AND VESTIBULAR IMPAIRMENT IN HARMONY (NINETEEN CASES).

(1) Female, aged 48. Supposed cause of nerve-deafness secondary to chronic middle-ear catarrh. Deafness severe in right ear, less severe in left. Duration ten years. Vestibular response much impaired in right ear, absent in left.

(2) Female, aged 17. Supposed cause of nerve-deafness secondary to middle-ear suppuration, now dry. Deafness severe, of five years' duration. Began with vertigo. Vestibular reactions, impaired left, normal right ear.

(3) Female, aged 22. Secondary to chronic middle-ear catarrh. Deafness nearly absolute. Vestibular responses markedly deficient.

(4) Female, aged 60. Cause, senility. Moderate deafness. Vestibular responses, much reduced right, normal left.

(5) Female, aged 70. Cause, senility. Moderate deafness. Vestibular responses deficient in both ears.

(6) Female, aged 73. Cause, senility. Deafness slight. Vestibular responses, normal right, impaired left.

(7) Female, aged 67. Cause unknown. Deafness absolute in right ear, and of many years' duration. Vestibular responses much impaired on both sides.

(8) Female, aged 44. Cause, unknown. Deafness moderate. Vestibular reactions impaired.

(9) Male, aged 55. Noise-deafness severe. Vestibular responses impaired.

(10) Male, aged 24. Supposed cause, middle-ear suppuration, now dry. Deafness nearly absolute, of six years' duration. Vestibular responses, right absent, left exaggerated (!).

(11) Male, aged 39. Cause, trauma (? fracture base of skull). Deafness absolute left ear, normal hearing right. Vestibular responses, absent left, normal right. Spontaneous nystagmus to right.

(12) Male, aged 39. Noise-deafness: severe in right ear, moderate in left. Vestibular responses, very feeble in right ear, impaired in left.

(13) Male, aged 37. Supposed cause, hereditary syphilis (?). Deafness moderate, of four years' duration. Vestibular responses impaired.

(14) Female, aged 51. Supposed cause, tabes (?). Deafness severe, of fifteen years' duration. Vestibular responses very feeble.

(15) Male, aged 60. Supposed cause, effusion into canals; "labyrinth storm" three months previously. Deafness slight. Vestibular responses impaired.

(16) Male, aged 49. Supposed cause unknown (? neurasthenia). Deafness slight, of several years' duration. Vestibular responses slightly impaired. Reports recently improvement (letter).

(17) Male, aged 35. Supposed cause unknown. Deafness moderate, of eight years' duration. Vestibular responses impaired.

(18) Female, aged 18. Supposed cause, hereditary syphilis. Moderate deafness, two years' duration. Vestibular responses impaired. Reported better lately (letter).

(19) Dr. Adam Gray's case. Female, aged 26. Supposed cause, effusion into canals. (Patient anæmic.) Absolute deafness right, of three weeks' duration, normal hearing left. Vestibular responses, absent right, normal left.

(*B*) WITH COCHLEAR AND VESTIBULAR IMPAIRMENT NOT IN HARMONY (SEVENTEEN CASES).

(A) With the Cochlea chiefly Impaired (Thirteen Cases).

(*a With Vestibular Reactions Normal* (*Five Cases*).

(1) Female, aged 47. Cause, functional derangement. Deafness severe, of four years' duration. Vestibular responses normal. Recovery of hearing after simple tonic treatment for a year.

(2) Female, aged 22. Supposed cause, oto-sclerosis (?). Deafness slight, of one year's duration. Vestibular responses normal.

(3) Female, aged 41. Cause unknown (? functional). Deafness, severe in right ear, eleven years' duration ; normal hearing in left. Vestibular response, normal on right side.

(4) Female, aged 16 (shown at the Otological Section). Cause, functional derangement. Deafness moderate. Vestibular responses, normal. (*Journal of Laryngology, Rhinology, and Otology*, xxv, p. 372.)

(5) Female, aged 37 (shown at the Otological Section). Cause: Right ear, middle-ear suppuration (now dry) ; left ear, functional derangement. Deafness severe in both ears ; right, of many years, left, of three months' duration. Vestibular responses, much impaired in right, normal in left ear. (Hearing restored by caloric test.) (*Journal of Laryngology, Rhinology, and Otology*, xxvii, p. 38.)

(*B*) *With Vestibular Reactions Exaggerated* (*Eight Cases*).

(1) Female, aged 26. Supposed cause, typhoid fever (? neurasthenia following). Deafness moderate. Vestibular responses, normal on right, exaggerated on left side.

(2) Female, aged 22. Cause, functional derangement. Deafness moderate. Vestibular responses exaggerated. Deafness passed off in six months.

(3) Female, aged 33. Cause unknown. Deafness severe, absolute in left ear. Vestibular responses exaggerated. (Subsequent history unknown. Lost sight of.)

(4) Female, aged 67. Supposed cause, Bright's disease. Deafness moderate, of nine months' duration. Vestibular responses rather exaggerated.

(5) Female, aged 20. Supposed cause, functional derangement (?). Deafness slight, of eleven years' duration. Vestibular responses, normal right, exaggerated left.

(6) Female, aged 38. Supposed cause, functional derangement. Deafness moderate. Vestibular responses exaggerated.

(7) Dr. Adam Gray's notes. Female, aged 56. Supposed cause, neurasthenia. Considerable deafness left, normal hearing right. Vestibular responses, exaggerated left, normal right. Seven months later, hearing and vestibular responses normal both ears.

(8) Dr. Adam Gray's notes. Male, aged 25. Supposed cause, post-traumatic neurasthenia. Deafness slight. Attacks of vertigo. Vestibular responses exaggerated. Improvement later.

(B) With Vestibule chiefly Impaired (Four Cases).

(1) Male, aged 50. Supposed cause, effusion into canals; "labyrinth storm" some months previously. Deafness very slight. Vestibular responses markedly impaired.

(2) Male, aged 40. Supposed cause unknown. Deafness, severe in left ear, of one year's duration ; hearing normal in right ear. Vertigo experienced at start of trouble. Vestibular responses markedly impaired. (Later report—letter—hearing in right ear not so good.)

Female, aged 53. Cause, arterio-sclerosis, chronic Bright's disease. Trifling loss of hearing. Severe tinnitus of ten years' duration. Vestibular responses markedly impaired.

(4) Dr. Adam Gray's notes. Male, aged 75. Deafness, slight right, severe left, of six weeks' duration. Vertigo at start. Vestibular responses very feeble in both ears. Later, deafness has become worse.

N.B.—Notes refer to both ears save where noted to the contrary.

Mr. N. Bishop Harman: As a contribution to this discussion it may be of interest to give the returns of the occurrence of nystagmus in cases of blindness in children. These are taken from the records of over 1,000 children whom I have had under observation during the past ten years. They come under my observation about the ages of 5 to 7, and leave at 16 years of age. During the period of observation they are examined many times. The cases may be grouped according to the manner in which the blindness has come about: (I) Surface inflammations destroying or seriously damaging the cornea. (II) Uveitis. (III) Congenital defects and allied conditions.

Group I.—Surface Diseases.

(*a*) Ophthalmia neonatorum accounts for 85 per cent. of these, and in blindness resulting therefrom nystagmus is of almost regular occurrence. In my notes of the earlier years no particular note was made of the occurrence, but in the later series note was made of its presence or absence, and in ninety cases so noted there was in every case nystagmus of some degree, from rapid, wide oscillation to irregular swaying or jerky movements of the damaged eyes. In two of these there was head nodding in addition. And in a further two there was nystagmus of the stumps when the globes had been excised. In these two cases I was unable to discover whether the nystagmus had been antecedent in appearance to the excision of the eyes or no. It is noteworthy also that the nystagmus was not in any way correspondent to the degree of damage to the eyes, it was as marked in some cases where there was but little damage as in eyes where the damage had been extreme and productive of gross staphylomata.

(*b*) In purulent conjunctivitis arising from conditions other than birth infections there were a great variety; many infective agents were concerned. The blindness occurred at different ages, from as early as 6 months to as late as 7 years. In fifteen of these the notes definitely recorded the absence of nystagmus. In one case there was gross nystagmus: the blindness was due to scarlet fever at the age of 2½, but the case was further complicated by middle-ear disease on the right side, so that it is possible that the nystagmus had an origin other than in the blindness. In two other cases there were observed occasional jerky movements of the eyes: (i) Eyes lost at the age of 6 months from purulent conjunctivitis, cause unknown; occasional jerks to the right side. (ii) Eyes lost at the age of 5 years; one month later occasional jerks of globes to right or left noticed.

The difference between these two sets of cases, so far as the occurrence of nystagmus is concerned, is striking, and it must be due to the date of the onset of the blindness or partial blindness. From observations on infants, I conclude that the fixation faculty, or the correlation of the macula with the central registering mechanism, is developed very early in life, as early as the third week, and it would seem that when the eyes are closed for a period of some weeks or months by a violent inflammation, and perhaps only open then with more or less opaque corneæ, the fixation faculty does not develop. It is only by some such hypothesis as this that the presence of nystagmus can be accounted for in children where the permanent damage to the cornea of one eye is of the slightest, and yet there is a serious defect of vision, which cannot be accounted for by the condition of the media or by any changes in the fundus. It would seem that the occurrence of nystagmus in cases of blindness obviously due to purulent conjunctivitis, but where the history of the case is unknown, may be taken as a point in differential diagnosis; if nystagmus be present the case is likely to be one of ophthalmia neonatorum, if it be not present then the onset of the disease was probably of another and later origin. The distinction is of value for statistical purposes.

(*c*) Phlyctenular keratitis comes into this group, and there were thirty-seven cases of blindness due to this cause; in not a few one eye had been a total loss, and had been excised; but in not one of these thirty-seven was there any sign of nystagmus. This is not to be wondered at when it is remembered that in most the damage is not sudden, but the result of several attacks of ulceration, and that it does not occur until from 3 to 7 years of age.

GROUP II.—UVEITIS.

(*a*) Anterior uveitis. Most of these cases are due to interstitial keratitis; no less than 190 were definitely of inherited syphilitic origin. In some the blindness was severe, in others there was some degree of vision through the clouded cornea. In 130 of these there was so far as could be known no posterior uveitis, and in not one of these was there any sign of nystagmus. In the other thirty there was either optic atrophy or disseminated choroiditis, and in four of the cases there was nystagmus. There were a further fourteen cases probably, but not certainly, due to syphilis, and in none of these was there nystagmus. Interstitial keratitis and cyclitis due to tubercle and other causes accounted for seven cases, and in none was there nystagmus. Of syphilitic iritis there were seven cases, all without nystagmus.

(*b*) Posterior uveitis, including optic atrophy with or without disseminated choroiditis, sympathetic disease, and cases of complicated myopia. (i) Optic atrophy, not syphilitic :—

Family cases	7	Nystagmus in	3	With head-nodding 1
Cause indeterminate	31	,,	19	
Meningitis	10	,,	5	
Post-febrile	5	,,	3	
Hydrocephalus	9	,,	1	
Oxycephaly :—				
Blind	6	.,	1	
Partly blind	3	,,	1	
Accidental injury	3	,,	1	

(ii) Disseminated choroiditis, cause unknown, eighteen cases; nystagmus in five. (iii) Optic atrophy with or without disseminated choroiditis due to inherited syphilis.

Children with fairly good intelligence	71	Nystagmus in	21
,, mentally defective	28	,,	11
., insane during or after school years	26	,,	1
., epileptic	11	,,	5

(iv) Sympathetic disease, sixteen cases, no nystagmus. (v) Complicated myopia, detached retina, &c., thirteen cases, of which three had nystagmus. In this group of cases of blindness due to uveitis there is a marked difference in the occurrence of nystagmus. In the cases of interstitial keratitis, even of the most severe order, there was no occurrence of nystagmus except in the few cases where it was known that there were co-existing changes at the back of the eye, such as optic atrophy or disseminated choroiditis. On the contrary, when there was posterior uveitis or optic atrophy, without anterior changes, nystagmus was very common. The total cases of posterior uveitis number 181, and of these ninety-four had nystagmus. The inference is that damage to the optic nerve is more liable to destroy steadiness of fixation than the gravest loss of vision due to opaque cornea. There is one other deduction that naturally arises from the opposition of these figures. The facts that more than 50 per cent. of the cases of posterior uveitis develop nystagmus, and that no nystagmus appears in cases of interstitial keratitis (except where posterior changes were known to exist) seems to indicate that the inflammatory changes of interstitial keratitis are confined to the anterior segment of the globe. It is rather curious to note the rarity of nystagmus in those cases of syphilitic uveitis where insanity came on during or after school years—only one case in twenty-six. Whether it is a mere coincidence or has some definite basis in the central defect, I do not know.

GROUP III.—CONGENITAL AND ALLIED DEFECTS.

(*a*) Defects of the crystalline lens:—

Congenital dislocation ...	19 cases ...	Nystagmus in 1 ...	
,, cataract ...	50 ,, ...	,, 22 ...	Head-nodding 1
,, ,, in idiots ...	6 ,, ...	,, 2 ..	
,, ,, in microphthalmia	17 ,, ...	,, 7 ...	
Posterior polar cataract ...	20 ,, ...	,, 9 ...	

Of post-natal lamellar cataract there were thirty cases; of these only one had nystagmus, and in this case the origin of the cataract in point of time was uncertain. These two orders of ante- and post-natal cataract show a marked contrast in the incidence of nystagmus. In the congenital cases it is common; they total ninety-four cases, and of these forty, or 43 per cent., had nystagmus, whereas nystagmus did not occur in lamellar cataract of "rachitic" or febrile origin (with one uncertain exception). This rather indicates that the general failure of development of the eye in the congenital cataract is the real cause of the nystagmus, and not the opacity that cuts off or deforms the image of the light. This is supported by the fact that most of the congenital cataract cases had been successfully operated, yet the vision remained so poor that they had to be admitted into blind schools. The lamellar cases of post-natal origin had for the most part been operated upon, but they were the failures of surgery. In a few cases operations had not been performed owing to parental objections. It is, of course, equally arguable that the difference arises from the probability that the lamellar cases of post-natal origin had possessed clear vision at some period of life, and that therefore the macula had received the necessary stimulus of a true focus of images. But against that may be set the cases of congenital dislocation of the lenses; in none of these had there ever been a true or even approximate focus, yet of nineteen cases only one had nystagmus.

(*b*) Defects of pigmentation or of the macula:—

Albinism	26 cases	Nystagmus in	26
Congenital deficiency of macula	8 ,,	,,	7
Coloboma of macula	6 ,,	,,	3
Day-blindness	6 ,,	,,	6
Congenital nystagmus, no cause found	—		3
Family choroiditis	3 ,,	,,	2

In these cases the incidence is very high, and it accords with the theory that a defect of the macula, as the essential factor in steady fixation, is at the basis of ocular nystagmus.

(*c*) Odd cases of defect of the globe or its appendages.

Extreme hypermetropia (one of these had 17D. of H.)	3 cases	Nystagmus in	0
Defect of the external ocular muscles	2 ,,	,,	2
Glioma of retina, one eye excised, the other highly myopic	—	,,	1
,, ,, both eyes excised	2 ,,	,,	0
Congenital anophthalmia	2 ,,	,,	0
Microphthalmia	17 ,,	,,	3
Coloboma of iris and of choroid	10 ,,	,,	3
Aniridia	6 ,,	,,	5

Two of the coloboma cases had head-nodding also, and one of the aniridia cases. The nystagmus in the case of excision of one eye for glioma was obviously due to the high myopia in the remaining eye which caused very bad vision.

(*d*) Cases of inflammatory or congenital inflammatory origin:—

Retinitis pigmentosa	21	Nystagmus in	2
Buphthalmia	17	,,	1

In the retinitis cases there was often fair central vision, but the buphthalmia cases were blind. In both orders of cases there were several familial cases, a circumstance that suggests a congenital origin. The rarity of nystagmus in the buphthalmia cases rather supports the inflammatory hypothesis of the origin of these cases.

VARIETIES OF NYSTAGMUS.

The following is the variety of oscillations noted in the cases under review:—

Lateral nystagmus	193
Jerky lateral	12
Rotary	9
Rolling, combination of lateral and rotary	7
,, ,, ,, ,, with lid jerk	1
Vertical	2
,, and lateral, varies, and with facial spasm	1
"Metronome"	2
With head-nodding in addition	5
Nystagmus of stumps after double excision (the movement was lateral)	2
Unclassed	58

These figures confirm the preponderance of lateral nystagmus in cases of ocular origin.

"Metronome" nystagmus is a variety seen in two cases of complicated myopia. In these the globes appeared to be pivoted about the lower part of the cornea (the hour of six on the clock-face) whilst the upper part of the cornea moved from side to side in an arc of about 30°; it was just the movement made by the vertical arm of the metronome and as regular in rhythm.

Mr. R. J. COULTER (Newport, Mon.) said he had seen a considerable amount of miners' nystagmus, and he wished to endorse nearly everything which Dr. Llewellyn had said. He would, however, join issue with him on the question of refraction. He agreed that in the phenomenon now discussed there were two elements: the nystagmus and the neurosis. In studying the actual nystagmus, he thought one was dealing with only one part of it. In South Wales, the proportional incidence of nystagmus increased as one proceeded from west to east of the Principality; in other words, from the region of harder to that of softer coal. For example, it was much greater in Monmouthshire than in Glamorgan. This would seem to indicate that the discredited theory that the presence of gases in the air of mines had some influence in the causation of the disease was worthy of further investigation. The chief purpose which led him to speak was to exhibit actual lamps used by the miners, so that members could judge as to the amount of illumination they gave for working. First he showed a clean oil lamp, then an old oil lamp after eight hours' burning, then a form of electric lamp which had been recently introduced into the South Wales coalfields; the room meantime being darkened. It was yet too early to say what would be the effect of the much brighter lamp on the incidence of nystagmus; but a fortnight ago he asked a manager, on a visit down a pit, whether he had any knowledge of the effect of the new lamp. He replied that one man reported that he was getting nystagmus, and he would have to give up, but he thought he might be better if he had an electric lamp. One was found him, and though the incident occurred two months ago, the man was working still. Possibly this might mean a mere postponing of his ocular symptoms, but it certainly showed that the improved light enabled him to continue longer at work.

(The Discussion was adjourned until March 11.)

Sections of Neurology, Ophthalmology, and Otology.

COMBINED MEETING.

March 11, 1914.

Mr. Richard Lake, President of the Section of Otology, in the Chair.

DISCUSSION ON NYSTAGMUS.[1]

Dr. Wilfred Harris: From the point of view of the practical neurologist, who looks for the presence or absence of nystagmus in his routine examination of a case of possible nervous disease, it is firstly important for him to decide what movements of the eyes amount to real nystagmus, and what shall be ignored.

Some physicians may be in the habit of defining every irregular movement of the eyes on extreme lateral deviation as nystagmus, though it appears to me that a considerable number of people show unsteadiness of fixation on lateral deviation when the eyes are first turned outwards in the test, and that the presence of nystagmus should not be assumed unless the lateral movements are rhythmical and persistent during the test.

The second point of importance for him to decide is whether the nystagmus present is a symptom of cerebrospinal disease, or whether it is of ocular origin. Labyrinthine nystagmus is evoked only by special tests, and the few cases which cannot obviously be classed in either of the two categories—cerebrospinal or ocular—can usually be easily recognized, such as the rapid oscillatory nystagmus of head-nodding, often in one eye only. Steadiness of the eyes when fixed upon an object depends in the first place upon a clear image being received upon the fovea, and reflexly through the coördinating cerebral centres concerned in the movements of the eyes; the eyes are kept rigidly steady by perfectly coördinated tension of the eye muscles. If in early infancy the macular development is interfered with by corneal lesions, anterior polar cataract, or other interference with the development of a clear image upon the fovea, then the cerebral coördination is not brought into play to keep the eye rigid, and constant oscillatory movements are seen, as though in search for the macular image. The proof that cerebral coördination is present is seen in cases of binocular nystagmus due to early ophthalmia and perforation in which the movements disappear completely on covering up the bad eye.

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[1] Adjourned from March 4.

In albinism and in hereditary family nystagmus there is almost certainly defective macular development, and consequent low power of fixation. Thus ocular nystagmus may be said to be due to disease of the afferent path of the reflex for fixation of the eyeballs. Occasionally in adult life ocular nystagmus is produced by defect of vision, and then it may be uniocular, as in the case of uniocular nystagmus with optic atrophy in the eye only, which I showed at the first combined meeting.

Broadly speaking, ocular nystagmus is constant and oscillatory in all positions, while in nystagmus of central origin in which the coördinating apparatus for the movements of the eyes is at fault, the nystagmus is brought out especially on deviation of the eyes laterally or upwards, and is not apparent on fixation in the median line. This is because the muscular balance of coördination is almost even in this position.

Owing to the widespread area in the brain in which eye movements and vision are represented, the frontal lobe, occipital lobe, optic thalamus, anterior corpora quadrigemina, pontine nuclei and cerebellum, it is not surprising that disease in many situations of the brain may produce this symptom. Though disease of the cerebellum, which has an important coördinating effect on the movements of the eyes, is especially likely to cause nystagmus, yet most intense nystagmus is occasionally set up by tumour of the cerebrum, especially if it involve the optic thalamus. Such a case I have seen in a girl, aged 22, with a large tumour reaching from the thalamus to the cortex in the leg centre on the left side.

Dr. ADOLPHE ABRAHAMS: I am emboldened by the reference which Mr. Scott has made to my work on nystagmus to offer this small contribution to the discussion. I am emboldened the more to do so out of gratitude for the advice, instruction and encouragement, which Mr. Scott himself has so generously given to me; without which such work could hardly have been begun, and would certainly have never been completed.

It is without affectation that I express my diffidence, not merely because of the triviality of the results I can offer, but because, liberal enough as is the scope which this combined meeting affords, I cannot approach the subject as ophthalmologist, nor as neurologist, nor as otologist. In fact it was not as a student of nystagmus but entirely as a photographer with an extensive experience of rapidly moving objects that the project interested me.

Mr. Spicer has recalled to you the methods of nystagmography; may I be allowed to treat this subject in further detail? Passing over the purely vivisectional methods, we arrive at Wojatschek's photo-nystagmographe of 1908, although Mulder a short time previously appears to have employed instantaneous photography. I say "appears to have employed" because none of his results are extant. Again in 1910, Buys and Coppez exhibited some cinematograph results before the French Society of Ophthalmology; but not only were their own achievements condemned, but the opportunity was taken to criticize adversely the attempt in general to photograph this movement in comparison with the advantages of utilizing the nystagmograph which Buys has invented. This apparatus consists of a binocular frame bearing the small oval cups closed with indiarubber, and articulated to the arm of a movable lever. Each is connected by rubber tubes to an inscribing apparatus. The cups are obliquely placed on the upper eyelid on the inner side of each eyeball if horizontal nystagmus is to be exhibited; near the top of the eyeball in the case of vertical nystagmus. A screw permits exact regulation of the globe's excursions, and correspondingly of the membrane of the tambours.

I had worked for a considerable time at the photography of nystagmus before I learnt that similar methods had been employed on the Continent and, as I have said, abandoned and condemned. It is probable that these workers had experienced the same difficulties as my own. The chief difficulty in photographic representation is the very slight amplitude of the movement. I am well aware that such a statement does not at first blush sound feasible, the movement in a coarse nystagmus appears to be considerable. But it must be remembered that the human eye is a very capable micrometer, and readily perceives a movement of a degree of fineness which is quite invisible to the camera working inevitably at a certain distance from the moving object. I would say at once that the maximum movement I ever photographed was 2·6 mm., and this in the first series of pictures I took would appear as less than 0·1 mm. As the whole of this movement is comprised in from three to six pictures it is evident that the difference between consecutive pictures is inestimably small.

The majority of my experiments have been performed upon post-rotatory nystagmus elicited in a normal person. A chair was placed in position with a mask for the face fitted to it, and the subject seated himself leaning forward. The eyes were then focussed with extreme care. Subsequently I found it necessary, in order to obtain a sufficiently large image, to photograph one eye only—the right. The mask was employed to ensure resumption of the exact position of sharp focus, and across the right-hand eye-opening in the mask two fine threads were stretched at right angles to one another to appear in the photographs in order to simplify subsequent investigations. The subject then stood up with his eyes shut, and was rotated counter-clockwise, on an average eleven revolutions being performed in about twenty-three seconds. (I ought to add that the photographed eye had to be too near to the camera to allow of the use of an ordinary rotation chair.) He then resumed his position with his eyes fixed on an object to the right, and the machine was operated so long as movement was visible. As in each picture the intersection of the cross-lines serves as a fixed point, measurement thence to the inner end of the iris, which is sufficiently sharply demarcated, will give a numerical indication of the movement. In some experiments I fixed a tiny foreign body on the cocainized conjunctiva to act as another fixed point, but I did not find this of much service. I tried a great variety of methods of measurement without finding any more satisfactory than the simple procedure of fixing the photographs in turn upon the mechanical stage of a microscope from which the eyepiece and objectives were removed. A fine glass slide upon which two cross lines were ruled was then fixed on the stage, which was operated until the ruled lines coincided with the cross-lines in the photograph, observations being taken down the empty barrel and a small magnifying lens being employed as a final decision. The reading upon the vernier was then noted. The slide was then moved horizontally until the vertically ruled line coincided with the inner limit of the iris; another reading was taken and subtracted from the first.

It is admissible that by this method of measurement the element of personal error is not absent. But in the case of the majority of the pictures, at least six independent readings were taken on several occasions, and the final result selected was an average or a majority in favour of one figure. The absolute readings varied from time to time presumably with varying conditions of light and of physical fitness, but the relative readings nearly always remained constant. I estimate as the limit of accuracy of observation in my own case 0·05 mm. It is perhaps necessary to explain that such a horizontal measurement does not correspond exactly to the movement of nystagmus; one measures in fact the chord of which the actual movement is the arc. But a simple calculation shows that the difference is exceedingly small and quite negligible, amounting in the case of a movement of 2·5 mm. to only 0·0032 mm.

In my photographs of post-rotatory nystagmus ("nach-nystagmus") I found that the movement persisted for at least eleven seconds. Bárány, after experiments upon 200 normal persons, estimates the duration of post-rotation nystagmus as thirty-nine to forty-one seconds; but of course the fine movement towards the end would not be visible to the camera. My exact time relation was always ascertained by driving the motor of the cinematograph by electricity; and then, whilst the same speed was continued, photographing the second hand of a watch, thus ascertaining the number of pictures corresponding to each second of time. As a rule twenty-five to thirty pictures were taken per second.

As is very well known, post-rotatory nystagmus is of the type known as rhythmical, jerky, or spring nystagmus, or *nystagmus à ressort*, in which the movement in one direction (the nystagmic or primary phase) is faster than that in the other (reactionary or secondary phase). The oscillations occurred throughout with a regular frequency of four per second, each oscillation consisting of a nystagmic and a reactionary phase; that is to say, the frequency remains constant whilst the amplitude gradually diminishes.

Taking an average throughout the series, the ratio 3 : 5 was almost exactly obtained as regards duration of the nystagmic and reactionary phases. The two phases are approximately equal as regards the extent of the excursion. The velocity of the movements is curiously irregular in both excursions, particularly in that of the reactionary phase, and this variability appears to me to correspond to no system. Thus, whilst in thirty-six out of the forty-four nystagmic phases the duration was three-thirtieths of a second, no matter whether the extent of movement was great or small—viz., as great as 2·6 mm., as small as 0·65 mm.—in some the velocity was most rapid at the beginning, in others most rapid in the middle, and in others again most rapid in the last one-thirtieth of a second of its movement.

The observed eye as it comes to rest takes up a position to the outer side of the orbit, and its position of rest is in the direction of nystagmus—i.e., farther away from the side of stimulation than the mean position of deviation at the beginning of the movement.

The second nystagmic phase recorded had an amplitude of 2·6 mm., with an average velocity throughout of 26 mm. per second, the highest velocity recorded. The third reactionary phase recorded had an average velocity of 15·6 mm., the highest velocity of the reactionary phase. Although these are isolated examples of maximum velocity in the two directions, they correspond curiously enough to the relation 5 : 3 exactly. No interval of rest occurs between the termination of one phase and the beginning of the other, or at least such an interval of rest must be less than one-thirtieth of a second or it would be evident in two consecutive pictures.

There are two other observations which are of interest, although they have no direct bearing upon the subject. In one experiment a long voluntary movement of the eyeball occurred, and its velocity throughout was almost uniform, and for the greater part of its course as high as 78 mm. per second, which is about three times the velocity of the most rapid post-rotation nystagmus. (May I add, in deference to those who, like myself, are unable to think metrically, that 78 mm. per second is about one-sixth of a mile per hour?) In another experiment the eyelid closed during the passage of the eyeball from one fixed point to another, as naturally occurs when the gaze is thus transferred in order to block out stimulation from objects during the passage. During this transit the eyelid shuts completely and reopens completely in three-tenths of a second.

A number of departures from the average I had, until this discussion, come to regard as mechanical imperfections or more probably errors of observation. I am encouraged, however, after Mr. Spicer's ophthalmoscopic evidence of irregularities, to conclude that these departures were in fact faithful records of what occurred.

I need not dwell upon experiments with other varieties of nystagmus. Miners' nystagmus I found to be too fine and too rapid for photography; spontaneous nystagmus of various types were utilized, and the general differentiation easily defined into the two kinds of nystagmus—undulatory, in which the movements of deviation and return have identical velocity, and spring nystagmus, which I have considered in detail. But the very great labour involved in the analysis of the pictures of any one case have precluded the possibility of investigating sufficient for further general principles to be established. Buys, Coppez, and Hennebert have been enabled by their nystagmograph to make a considerable number of experiments, from which they have elaborated a large number of systems and classifications which I have never been able to reconcile with the few tracings my own methods have produced.

Mr. JOHN F. O'MALLEY: I am attempting to give a classification of nystagmus in a series of tables, contrasting the characters of the various types, and indicating the conditions under which they arise physiologically and pathologically. Such a classification is necessarily a difficult problem, and I am fully conscious of the shortcomings of this.

TABLE I.—NYSTAGMUS: TWO MAIN TYPES—OCULAR AND VESTIBULAR.

(1) Ocular: (*a*) Pseudo-nystagmus; (*b*) true nystagmus without visual vertigo;
(*c*) true nystagmus with visual vertigo.
(2) Vestibular: (*a*) Labyrinthine; (*b*) retro-labyrinthine (intracranial).
(3) Mixed ocular and vestibular.

Most observers seem to agree that there are two main types of nystagmus—namely, ocular and vestibular—and I would also suggest that, in certain cases, the two occur together spontaneously, to form a mixed type. In support of this view I would urge the following considerations:—

(1) We get a nystagmus presenting certain characters, caused by some disturbance in the neuro-muscular mechanism associated with the control of eye movements, when attempts at the visual fixation of objects are made, in persons whose labyrinths are perfectly healthy.

(2) This type can be elicited physiologically, and it occurs spontaneously under certain pathological conditions, and is best designated ocular nystagmus.

(3) We also get a nystagmus, presenting certain characters which differ from those under the first heading, when the neuro-muscular mechanism controlling eye movements is perfectly healthy, by throwing stimuli from the labyrinth along the ocular paths.

(4) This type is best designated vestibular. It can be elicited physiologically and also occurs spontaneously, in labyrinthine or retro-labyrinthine disease.

(5) The mixed type of ocular and vestibular can be demonstrated when vestibular tests are applied in persons who already present a spontaneous ocular nystagmus and the movements are practically similar to those observed in cases of unilateral cerebellar disease, so that the nystagmus seen in the latter is probably a mixed ocular and vestibular.

When testing for vestibular nystagmus in the presence of a spontaneous ocular, one gets a slow and quick rhythmic movement on deviation of the eyes to the side of the quick component, and the more rapid oscillatory movement to the opposite side. At times, unless the stimulus is very active, it is difficult to dissociate the quick and slow components on account of the previous spontaneous, bilateral, oscillatory type. Under these circumstances it appears as a slow, coarse, oscillatory nystagmus to one side, and a quick, fine movement to the opposite side. At such times it seems practically identical with that seen in unilateral cerebellar disease, and if this view is correct one must regard the coarse nystagmus to the side of the lesion in cerebellar affections as the vestibular rhythmic element, partly masked by the presence of an oscillatory ocular complement and by the absence of a very active stimulus. The stimulus applied to the vestibular tracts by a cerebellar tumour evokes a feebler response in the ocular paths than if the same stimulus was applied directly to the labyrinth. If time allowed, one could show some evidence which indicates that stimuli, applied directly to peripheral end-organs, evoke more active responses than when similar stimuli are introduced centrally, or along the paths which normally carry central impulses from these organs. The nystagmus away from the side of the lesion, in cerebellar disease, shows the characters of the purely ocular type.

Table II.—Ocular Nystagmus.

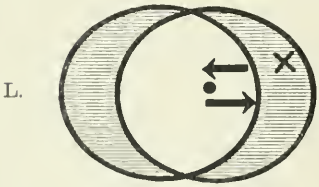
Pseudo-nystagmus is a hesitancy of fixation, and is elicited when the eyes are directed to an object near or outside the periphery of the binocular field of vision.

(1) Occurs when eyes near end of an excursion in some direction.
(2) Consists of movements from a terminal point and back to it again.
(3) Movements do not repass the point.
(4) Movements are jerky, indicating effort.
(5) Excursive power of eyes appears restricted.
(6) Velocity equal, not quick and slow; the outward movement being more jerky than return may suggest quick and slow.
(7) Excursions equal.
(8) Bilateral more often than unilateral.
(9) Occurs in { Hereditary ataxia.
Disseminated sclerosis (often).
Neurasthenics.
Other nervous affections.

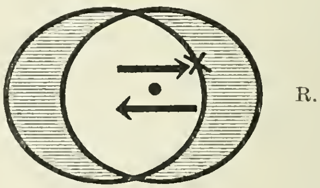
Table III.—Ocular Nystagmus (*continued*).

True nystagmus is a hesitancy of fixation, and is elicited when the eyes are directed to an object near or inside the periphery of the binocular field of vision.

(1) Occurs when eyes in primary position or near it.
(2) Consists of oscillations to and fro about a central point.
(3) Movements pass and repass central point.
(4) Movements are smooth and regular.
(5) Excursive power of eyes not restricted.
(6) Velocity equal in ocular, unequal in vestibular.
(7) Excursions equal (in vestibular quick appear greater than slow).
(8) Usually bilateral.
(9) Forms—horizontal, rotary, vertical, mixed.
(10) Occurs { Physiologically.
Pathologically.



Pseudo-nystagmus.



True nystagmus.

There is no visual vertigo associated with the ocular nystagmus which begins in early life, but when acquired late (miners'), visual vertigo is present, but is relieved on closing the eyes.

TABLE IV.—OCULAR NYSTAGMUS (*continued*).

(*A*) *Physiological.*

(1) Eye movements following moving objects (looking out of a moving train).
(2) Turning in a chair. (It can be elicited in deaf-mutes with destroyed labyrinths.) (The converse of this is the inability to obtain vestibular nystagmus in those born blind, even though their labyrinths are normal.)
(3) Revolving cylinders with black and white stripes. (Gives nystagmus in any direction except rotary.)
(4) Extreme convergence in some cases.
(5) Trying to fix objects beyond binocular field in some cases. (May be pseudo-nystagmus also.)

TABLE V.—OCULAR NYSTAGMUS (*continued*).

(*B*) *Pathological* (*spontaneous*).

- (*a*) Eyes
  - Congenital and acquired anomalies
    - (1) Microphthalmus.
    - (2) Coloboma.
    - (3) Albinism.
    - (4) Retinitis pigmentosa.
    - (5) Leukoma.
    - (6) Anterior polar cataract.
    - (7) Optic atrophy.
- (*b*) Occupation
  - (1) Miners' nystagmus.
  - (2) Compositors' nystagmus.
- (*c*) Nervous diseases
  - (1) Ataxic paraplegia
  - (2) Primary spastic paraplegia.
  - (3) Hereditary ataxia.
  - (4) Disseminated sclerosis.
  - (5) Severe multiple neuritis.
  - (6) Syringomyelia.
  - (7) Progressive muscular atrophy.
- (*d*) Other diseases
  - (1) Spasmus nutans (rickets).
  - (2) Neurasthenia.

TABLE VI.—VESTIBULAR NYSTAGMUS.

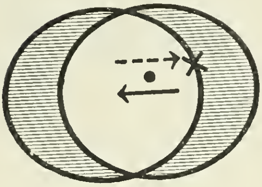
Vestibular is a true nystagmus, but has some added qualities beyond those already mentioned, due to labyrinthine or retro-labyrinthine stimuli flowing along the ocular paths.

Points 1, 2, 3, 4, 5, are like those under the heading "true nystagmus."
(6) Velocity unequal—i.e., quick and slow components.
(7) Excursion equal, though quick appear greater than slow.
(8) Conjugate—i.e., both eyes move equally and simultaneously. (*a*) May be elicited when eyes directed to any point of binocular field (in gross labyrinthine stimulation). (*b*) Quick and slow movements are constant in direction. (*c*) May be elicited only when eyes directed to the periphery of binocular field towards which quick movement goes (mild stimulation).
(9) Forms—horizontal, rotary, vertical and mixed (horizontal and rotary).

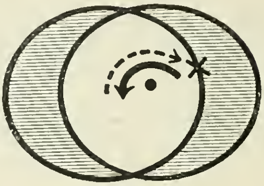
- (10) Duration
  - Physiological
    - Horizontal 40 seconds (grows less and less).
    - Rotary 20 seconds.
  - Pathological, from minutes to days or months.
- (11) Occurs
  - Physiologically.
  - Pathologically.

The visual vertigo which is present in association with any active spontaneous or induced vestibular nystagmus, is not apparently relieved by shutting the eyes, because a labyrinthine or retro-labyrinthine vertigo is superadded and equilibration disturbance results.

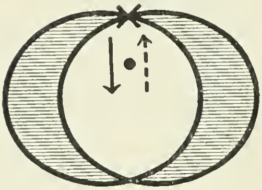
TABLE VII.—VESTIBULAR NYSTAGMUS (*continued*).



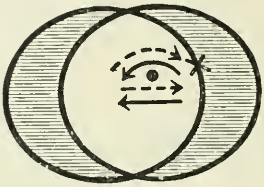
Horizontal.



Rotary.



Vertical.



Mixed (horizontal and rotary).

× Object.
- - - → Quick component.
←— Slow component.

TABLE VIII.—VESTIBULAR NYSTAGMUS (*continued*).

(1) *Labyrinthine.*

(*a*) Physiological.
  (1) Rotation tests (with head in three planes of semicircular canals).
  (2) Caloric tests (hot and cold water).
  (3) Electrical stimulation.
(*b*) Pathological (spontaneous).
  (1) Very acute middle-ear affections.
  (2) Labyrinthine affections
    (*a*) Serous labyrinthitis.
    (*b*) Diffuse suppurative labyrinthitis.
    (*c*) Circumscribed labyrinthitis.
    (*d*) Hæmorrhage.
    (*e*) Syphilis.
    (*f*) Traumatic
      Basal fractures.
      Operative.

The nystagmus possesses the characters mentioned above, but its duration is from a few minutes to several days (or even months in unilateral ablation).

TABLE IX.—VESTIBULAR NYSTAGMUS (*continued*).

(2) *Retro-labyrinthine* (*intracranial*).

Pathological.

(1) Cerebellar tumours { Intra.
Extra.

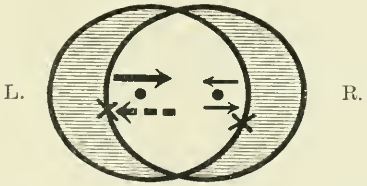
2) Cerebellar abscess { Intra.
Extra.

The nystagmus here possesses certain of the characters of the vestibular type associated with labyrinthine disease, but it does not tend to decrease like the latter.

(3) Meningitis.
(4) Hydrocephalus.
(5) Cerebral hæmorrhage (transient).
(6) Toxic { (*a*) Tobacco.
(*b*) Alcohol.
(*c*) Auto-intoxication.

TABLE X.—MIXED OCULAR AND LABYRINTHINE NYSTAGMUS.

(1) This can be demonstrated in patients who already show spontaneous ocular nystagmus by applying the usual tests which induce vestibular nystagmus.
(2) In posterior fossa lesions (cerebellar tumours and abscesses) the two types are probably mixed through the irritation of both ocular and vestibular paths.



Mixed ocular and vestibular nystagmus.

Mr. GRIMSDALE said that the Royal Normal College for the Blind, at Norwood, was a magazine of ophthalmological curiosities. He had kept rough notes of many of them; he had frequently noted the occurrence of nystagmus. It was most common in the subjects of ophthalmia neonatorum, who numbered more than half the cases. There were also, however, a large number of pupils in whom nystagmus had followed injuries to the cornea at a considerable distance after birth. He had thought it of interest to note the ages at which this was seen; up to the age of 5 a severe injury to the cornea was frequently followed by nystagmus; in one case an extensive lime-burn at the age of 6½ was followed by nystagmus. Similarly optic atrophy or severe metastatic uveitis after specific fevers, so long as the fever occurred before the age of 5, was often followed by nystagmus. After this age the sequence was rare. With regard to Mr. Spicer's statement in opening that nystagmus never occurred in congenital total blindness, he wished to relate a case. Five or six years ago he was asked by a doctor to see his child, who at the age of 5 months paid no attention to light, even though a 25-candle-power lamp was focused on the eyes. The child was the subject of aniridia, so that the pupil reflex was not obtainable. He sought for some symptom which would hold out any hope to the parents, and found nystagmus. He told the father that he had always taught that when nystagmus was present the eyes were not blind. The child, up to the age of 18 months, still paid no attention to light, but at the age of 2 seemed to see a little, and now at the age of 7 could read letters of Snellen 6 or 8. This case might be held to justify the generalization made by Mr. Spicer, and to allow some importance to the presence of nystagmus as a prognostic sign.

Mr. BERNARD CRIDLAND desired to bring forward a point concerning coal-miners' nystagmus, and the field of vision. This was easy to test when the nystagmus was getting better, and sometimes in its early stages. He now had a collection of seventy charts, which had enabled him to summarize in this way: That in practically all the cases a contraction of the field existed for white, blue and red; it was of the concentric type, and more or less symmetrical in shape, though not always in depth. The colours were usually in their correct order, but occasionally the various colour fields interlaced, the correct order being re-established as the case improved. As the disease improved, so did the fields, but the contraction persisted as long as subjective signs were present. The contraction might persist for months after both subjective and objective signs had vanished; but whether the contractions were permanent in the disease he could not at present say. Most of the cases showed blepharospasm, neck-twitching, &c. The changes found in the fields resembled those in nervous subjects, which might be termed functional; and possibly the explanation was that these subjects of nystagmus were also neurasthenics. That miners were prone to suffer from neurasthenia had been shown by Dr. Shufflebotham in the Milroy Lectures. Still, recalling the cases he had seen, his impression was not that they were neurasthenics; for, with few exceptions, they were vigorous and healthy looking. When examining a man for nystagmus under the Workmen's Compensation Act, if he complained only of occasional symptoms—i.e., that his eyes went round while he was sweating at his work, or when he stooped—and yet on examining him no nystagmus was evident by any test whatsoever, contraction of the visual fields was good confirmatory evidence that the disease existed. It suggested that the higher visual centres participated in the disturbance which affected the oculo-motor centres, and afforded additional evidence if such were needed that miners' nystagmus was rather a disease of the nervous system, of which the nystagmic movements of the eyes formed the premier symptom. (He showed examples of the fields.) Five or six years ago it was said by certain French surgeons that the visual fields showed no changes in this disease, but he thought it would now be agreed that such was not the case.

Mr. ANGUS MACNAB: My remarks will be confined to that phase of this discussion which is concerned with miners' nystagmus. I will endeavour to treat the subject on the broadest possible lines. Some of the considerations which I shall lay before you may appear so elementary as to demand an apology for taking up your time with them, but they appear necessary for the development of the argument which I wish to present to the Society, and as such I crave your indulgence.

There are certain considerations in the realm of the physiology of the light sense which I think should be brought forward in a discussion such as this, if any explanation of the symptoms of the disease, *miners' nystagmus*, is to be complete. When we consider the visual conditions when the illumination is gradually reduced, we find that there is a marked difference in the functional activity of different parts of the retina. In vision in a bright light or *photopia*, there is an enormous preponderance of the macula; if the illumination be reduced this preponderance is also reduced, till on reaching the "threshold of sensibility" the extra-macular areas alone are stimulated. The basis of this functional difference is found in the difference between the rods and the cones. In *photopia*, the activity of the cones predominates, but with a reduction in illumination the rods become more and more important until the threshold of stimulation of the cones is passed, and perception of faint degrees of luminosity is only possible to the rods.

In the macula there are only cones and no rods. In the rest of the retina the cones are separated by several layers of intercalated rods, the number interposed between adjacent cones varying in different parts. After an eye has been subjected to a low degree of illumination it gradually becomes adapted to its environment, and passes into the condition of *scotopia* or dark-adaptation, with a relative predominance of the rods over the cones.

The power of fixation is an evolution of the photopic eye having an enormous preponderance of the rod-free macula. In an eye which is kept for long periods in a condition of extreme dark-adaptation, the basis upon which the faculty of fixation has been superimposed will certainly be seriously undermined, if not entirely destroyed.

The predominance of extra-macular areas in the dark-adapted eye is well shown in the following account by Professor Lohmann as he observed the morning dawn: "My bed was shut off from the window by a folding screen, and the night was so dark that after several hours in my room I could distinguish nothing. As the morning dawn slowly crept in I was able by excentric fixation to distinguish the first glimpses of light on the wall opposite. As the grey light of the morning waxed, a less excentricity of gaze enabled me to see the light on the wall; I was then conscious of a definite central scotoma, which vanished with the increase of the dawn."

Miners' nystagmus occurs in men who are working in a very dim light, and it appears to be most prevalent in those miners working on coal having a particularly high power of absorbing light. It is a reasonable presumption that these men are constantly exposed to conditions where if there be not an actual central scotoma, such as Lohmann observed, at least there is a greater or less preponderance of visual power in the extrafoveal rod-bearing areas of the retina. *Fixation* in their case is, therefore, in a state of very unstable equilibrium. Dr. Llewellyn stated that the miner was engaged in work which necessitated the delivery of carefully aimed blows, and showed that a certain amount of concentration of vision and attention was necessary for the work. This is undoubtedly a factor of great importance in the evolution of the clinical picture of nystagmus. The exhaustion ensuing on the use of the eyes under unfavourable conditions is of at least two varieties. There is firstly the difficulty in obtaining clear images on the retina, but a good optical effect is not impossible; an example of this is seen in every case of early presbyopia. The exhaustion which here ensues is primarily motor, and concerned with the neuromuscular apparatus for maintaining the eye in focus. Under other circumstances the difficulty encountered is in the interpretation of the images, or rather in the analysis of the nerve impulses projected into the visual centres, a difficulty due to either the optical imperfection of these images, as in the case of astigmatism, or to the failure of light difference in the image from insufficiency of illumination, as in reading by dim light. Subject to correction, I would put it that an exhaustion of this higher central activity has a more profound effect on the nervous system of the individual and is more likely to produce a neurosis, or a psychosis.

The miner after many years of work under such conditions as undermine and tend to destroy his power of fixation, conditions which also produce a chronic exhaustion of certain of his higher centres, requires very little reduction in his powers of resistance to develop a tremor of the eye muscles, and the fully developed clinical picture which is known as miners' nystagmus.

If these views of the ætiology of the condition be accepted, it will be clear that the influence of a refractive error as a factor in causation must be extremely small, if indeed it exists. On the other hand, an error of muscle balance might have some considerable weight, and it would be an interesting research to determine what proportion of the affected miners suffered from heterophoria. While naturally every influence which affects the general state of health of the men will play a part in determining the onset of the disease, such factors as, for instance, the presence of gases in the mine, must be quite secondary. This proportion of gas in the workings may be related to the physical condition of the coal being worked, and, inasmuch as a dull non-reflecting coal may give off more gas, the presence of gas and of nystagmus may have an intimate relation, but not that of cause and effect.

Regarding prevention the indications are clear; the illumination of the actual coal face must be increased to such an extent that the predominance of the macula over the rest of the retina is again established. There are two lines which could be taken up; the actual source of light could be improved, and we have seen examples of this in the portable electric lamp; or the face of the coal seam could be rendered more reflecting. It surely cannot be beyond the ingenuity of miners to devise some form of cheap and rapid whitewash spraying apparatus, which could render the illumination at the working face sufficient to re-establish vision on more normal physiological lines.

Mr. T. B. LAYTON: I should like to say a few words on the practical use in neurology of those tests of the vestibular nerve of which a physiological nystagmus forms a part. There are very divided opinions upon their value both in the diagnosis and prognosis of nervous disease. In the course of a conversation last summer, one who has had some considerable experience in brain surgery told me that he thought, when these tests were carefully done by a man who really did know something about them, they were about as valuable as a von Pirquet's reaction. On the other hand, when I was in Vienna two years ago, I took the opportunity of seeing Bárány at work in the neurological clinic, and there is no doubt that in his hands the tests are of enormous value. I had, indeed, visions of the otologist, with his cup of cold water and his little squirt, driving out of existence the neurological surgeon by wresting away those parts of the cranial cavity that have been left to him since the rhinologist entered through the pituitary fossa. But Bárány is a specialist of the specialists, and for the ordinary man the truth lies probably between these two views. On my return I found the tests of much greater difficulty in their application than I had imagined. I am perfectly willing to admit that at the present time my opinion on the subject is about as valuable as that of a medical student on the lungs at the time he first goes in for his final examination; but I am beginning to see light through the darkness, and should, therefore, like to add my small voice to those of the more experienced otologists who have spoken in favour of these tests during this discussion. In support of this I will touch on the two things which I have found in practice make the tests most difficult. One is the unfortunate connexion between Deiters's nucleus and the medullary centres. I sometimes find it hard adequately to stimulate the oculomotor and cerebellar centres without over-stimulating the medullary ones to an unpleasant degree. The first patient whom I tested deposited her dinner down a neighbouring sink. The other difficulty is the deficient development of coördination often found, even in the normal person. One does not expect the same coördination in the horny-handed son of toil as one would look for it in the skilled pianist or the highly trained surgeon, but even among the more highly educated, as represented by a medical student, a distinct effort of will is often necessary exactly to bring the finger back with the eyes shut to the place from which it started; and in doing the test it is difficult to estimate how much of the deviation is due to the withdrawal of the cerebral control and how much to the stimulation of the vestibular nerve. Now this effort of will is removed when the medullary centres are upset. Fully to understand what I mean, I would have you consider yourself at that stage of a Channel crossing where you are not quite sure whether you want to live or not, but you are perfectly certain that you do not mind dying, and then to imagine that, instead of a kindly steward leading you to the leeward of the ship, and offering you a friendly basin, he were to shake you brusquely by the shoulders, and shout in your ear: "Open your eyes—look at my finger—shut your eyes—put out your hand—down—up—out—in—forwards—backwards—upside down." I think, sir, that in such a case you would gaze at that steward with a look intended to commit him on a lengthy journey, or, as my patients have sometimes done with me, you would get extremely cross with him. I may say I have had some experience of these sensations; for when I was taking Bárány's course he found I was an excellent medium, in that I got a marked nystagmus and strong pointing reaction without more than the slightest feeling of nausea. He therefore tested me either for demonstration or research many a time without untoward circumstances until that fatal day on which, having a few spare minutes before the class, I occupied them in smoking a cigar, procured at a neighbouring café. I would suggest to our ophthalmo-neurological friends that if they wish to have a true insight into these tests, they should get a twopenny Manilla, and having smoked it, ask their otological colleague to syringe their ears with cold water.

If you have followed my argument, you will realize that I do not think that we have in these tests a short cut to the diagnosis of nervous disease, obtainable merely by the turning of a handle, but I do claim we may get from them evidence in a certain number of cases which, when correlated with that obtainable from other sources, will clinch a diagnosis that otherwise must have remained doubtful, or will exclude a gross lesion that otherwise must have been left under discussion. And on this I would base an appeal that the eighth nerve be looked upon in the same light as is the second. No one would dream of making a diagnosis of or of excluding an intracranial tumour without examining the second nerve. Why should one do so without a complete examination of the eighth nerve? The neurologists either must learn to do these tests themselves or they should send their cases to the otologist for examination and report, in the same way as they now either examine the fundus oculi themselves or ask the ophthalmologist to do so for them.

Dr. RUGG GUNN said he would confine his remarks to nystagmus in the case of albinos. As Mr. MacNab had already said, it was known that the rods were more sensitive to light than the cones, that under circumstances of dim illumination the cones became relatively functionless, and vision then depended almost entirely on the rods. In the case of such animals as bats, owls, and mice, the retina contained very few or no cones. Astronomers, again, were accustomed to look to one side of a star in order to get a clear image off the cone-bearing region on to the rods. In diseases of the retina associated with degeneration of rods, the converse condition—night-blindness—was found. If an eye in a condition of dark-adaptation, where the cones were relatively functionless and the rods active, looked at the spectrum of sunlight, the red end would appear shortened, and the brightest portion of the spectrum had moved towards the violet end, and was found in the green. It occurred to him, and had probably occurred to others also, that if in the albino the cones were found to be functionless, one would have, in this absence of a functionating macula or fixation point, a sufficient cause for the nystagmus, and perhaps also for the intense photophobia found in these cases. Such a person would be dark-adapted. And with the view of investigating this he examined for Purkinje's phenomenon nine albinos. Two were children, and he did not think the tests in them were satisfactory. Six of them also were, he thought, negative; they said the greatest brightness was in the yellow, and they claimed to see the red end of the spectrum. The ninth was a young man with a high degree of myopia, a very pure albino, with snow-white hair and irides practically devoid of pigment. He had nystagmus, of course. He could see no red end of the spectrum at all, and said the brightest portion was green. Except that he had a high degree of defective vision, one would say he was permanently dark-adapted; in other words, that the cone-bearing region was not functioning, the absence of this fixation point being a sufficient cause for the nystagmus. Last year he saw two cases, an aunt and a niece, patients of Mr. Rayner Batten. The older woman seemed to be an almost typical albino, but she had good vision and no nystagmus. Her niece, however, had very dark brown hair, her irides were dark brown, and her skin contained plenty of pigment. She had nystagmus, very defective vision, a high degree of error of refraction—mixed astigmatism—her fundus was pale, and the choroidal vessels could be distinctly seen. It was the sort of fundus met with in albinos. Such cases were interesting in such a discussion as the present, as giving some clue to the underlying genetic factors of these conditions, and the tendency shown for these to segregate from each other.

Mr. J. H. PARSONS asked whether the albinos mentioned by Dr. Rugg Gunn were totally colour-blind, because it was known that the totally colour-blind showed all those characteristics which were described. Totally colour-blind persons had been carefully investigated by many observers, by accurate methods, and had been shown to have exactly that distribution of light and shade in the spectrum for all intensities of light for which he had invented the term scotopic—i.e., the distribution of light and shade in their spectrum was the same for all intensities of light as it was for the normal person with dark-adapted eye and low intensities of light only.

Dr. RUGG GUNN, replying to Mr. Parsons, said the ninth individual could distinguish all the colours but red. He did not examine him with the Edridge-Green scotometer.

Mr. G. J. JENKINS desired to express disagreement with the generally accepted theory regarding the association of certain forms of nystagmus with certain canals. It had been held by Bárány and generally accepted, as described in the introductory paper by Mr. Scott, that rotatory nystagmus was associated with the superior semicircular canal and vertical nystagmus with the posterior semicircular canal. It appeared to him that the canal which received the maximum stimulation by rotation in lateral flexion of the neck and face turned forward and upward must be the superior canal, if the rotation be made from that side forward. This rotation would produce a vestibulo-ampullary current in the superior canal on the flexed side and an ampullo-vestibular current in the posterior canal of the opposite side. Other canals would be affected, but the resulting vertical nystagmus would probably be due to the preponderating influence of this superior canal and not the posterior canal. Similarly, he held that the posterior semicircular canal and not the superior was the important peripheral stimulus for rotatory nystagmus. He could not agree that sufficient evidence had been brought forward by the caloric test to prove that the various forms of nystagmus could be due to other canals than those described. At least, he held that anatomically the above reasoning was correct.

It was interesting to note that a nystagmoid movement artificially produced might cause vertigo with associated phenomena in certain cases. By rotating a cylinder with a series of spots on it and getting the patient to fix these spots as they came into vision, vertigo could be produced.

If these were done where there was an irritable labyrinth the nature of the vertigo could sometimes be changed at will of the operator. He had been in the habit for some years of testing for the irritable labyrinth by means of a mirror rapidly moved to produce a nystagmoid movement.

Mr. G. H. POOLEY sent the following communication: *Miners' Nystagmus.*—Type: The movements of the eyeball are rotatory, the pupil usually moving in a circle, generally a fairly large circle but sometimes a small one, or less frequently in an ellipse, with its long axis either horizontal or vertical. The rate of rotation is usually rapid, that is, about 150 rotations a minute or more. One eye may alone be affected or be more severely affected than the other, but the condition is usually symmetrical. The patient generally has his head inclined backwards and his eyes downcast; spasmodic movements of the eyelids are often present (blepharospasm). There is in most cases some tremor of the head, the muscles of the head and neck are firmly contracted as if by force, to counteract the movements of the eyes and steady the object the patient is looking at.

Stages: The manifestations of the disease vary considerably at different stages from its onset to its disappearance. They may be roughly classified as follows: (1) Latent. There is considerable rotation of the eyeballs, of which the patient is either unaware or not sufficiently inconvenienced to be unable to work, though in this stage he may, as pointed out by the late Mr. Simeon Snell, be a source of danger by being unable properly to detect the signs of the presence of gas in the workings. (2) The rotatory movements are practically constantly present, when walking or even when sitting; they cannot be controlled even on looking down, except for a few seconds. (3) Movements of the eyeballs are not present when the patient is walking or sitting and in looking straight in front of him or downwards, but commence on covering one of the patient's eyes or making him turn his eyes upward. (4) As above, but do not commence so readily. Stooping repeatedly, exertion, particularly in a stooping position such as the shovelling of coal from the ground, cause them to commence in daylight. (5) As above, but do not commence except under similar conditions in a darkened room.

The transition from the latent to the manifest stage is often very abrupt in its onset. A man may be at work as usual; all of a sudden he feels faint, falls or sits down and has to be led home. At other times, particularly in the autumn and winter, it is the rotation of the street lamps or the moon and stars on his way home from work, that by causing mental distress and a sense of insecurity make him fear to work. In stages 4 and 5 the onset of the rotation of the eyeballs is usually associated with giddiness, tremor, and perspiration; the patient may fall down or if asked to sit in a chair will stagger towards it and clutch at it. The transition from the latent to the manifest may be idiopathic or it may be accelerated by: (*a*) injury, particularly blows on the head; (*b*) suggestion—i.e., he is told he has nystagmus and loses his confidence; (*c*) ill-health, such as an attack of influenza.

Persons affected: (*a*) Coal-getters; (*b*) other workers in pit bottom; (*c*) workers in candle mines, approached by gallery from surface (no shaft); (*d*) stable employés (underground); (*e*) pit-sinkers and makers of permanent roads.

Cause: The feeble light by which miners work, the cramped position in which they work, are the two principal causes to which this condition has been attributed. The light in a pit is very feeble, only those who have been down can appreciate the intense darkness in which the miner works. His eyes are in a state of dark-adaptation and his macula is a blinder spot than the perimacular region, hence there is a tendency to fix with successive portions of the periphery of the macula as others become fatigued, hence possibly the rotation and nystagmus. This would bring the disease into line with the nystagmus due to ocular lesions—e.g., congenital cataract or changes in the fundus, in which the main condition is inability to obtain a clear image of an object and attempts to obtain a better are followed by an exaggeration of the movements originally designed to obtain improved vision.

Position: This, although probably not the cause, has something to do with the range of movement of the eyeballs and with the production of the manifest signs of the disease. The late Mr. Simeon Snell is said to have been able to tell a right-handed from a left-handed worker by the different range of movement of the eyes.

Age of onset: Some colliers develop definite miners' nystagmus in their 'teens after a few years' work in the pit; these may be regarded as predisposed to the disease. Many more develop it between 40 and 60 years of age, after twenty or more years in the pit.

Duration: From a few weeks to four, five or more years. Some of the working contractors who come for advice early recover in five or six weeks and return to work, but are always liable to relapses. Some who have given up work in the pit and taken to other work have definite rotation of the eyeballs so long as five years after giving up work. Two years is a common duration.

Treatment: Instruct the patient not to do anything to bring on the rotations. Tell him to take plenty of walking in the fresh air in daylight. Order him tonics, such as formic acid and nux vomica. Correct any errors of refraction. I allow a glass of beer at meal-times and an ounce of tobacco a week.

Unfitness for work: As far as our present knowledge goes, in stages 2, 3 and 4, the patient is unfit for any work that involves stooping, even in daylight. In stage 5 and for some months after all rotation has disappeared, he is fit for surface work. After an interval proportional to the duration and severity of the attack—i.e., after a severe attack of two years—an interval of six months is necessary before he can return to work in the pit. A patient who has had a first attack is always liable to relapses.

Prevention: There is no doubt that improved ventilation and improved methods of lighting will decrease the percentage of men who are incapacitated by this condition. The beneficial effect of improved lamps, electric or otherwise, has yet to be proved, however. I have had very unfavourable reports from two collieries where they have been adopted, and further experiment is necessary before any definite statement can be made. Any reduction that can be made will be a godsend to the miner and the colliery proprietor, who are both considerably out of pocket, and to the public, as it increases the price of coal.

Method of examination in doubtful cases: (1) Make the patient shovel imaginary coal for a period of from two to five minutes in a well-lighted room. Direct him to take his seat quickly and examine him by the indirect method; circular rotation of the optic disks shows that nystagmus is present. I do not consider that fibrillary vibrations and irregular movements of the eyeballs are sufficient to allow a diagnosis of miners' nystagmus to be made. (2) If the result of this examination is negative, repeat it in a darkened room, with as little light as possible, turning on, as the patient resumes his seat, the weakest light which is sufficient to enable you to examine the fundus.

PROCEEDINGS

OF THE

ROYAL SOCIETY OF MEDICINE

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1913-14

OBSTETRICAL AND GYNÆCOLOGICAL SECTION

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Obstetrical and Gynæcological Section.

October 9, 1913.

Dr. W. S. A. Griffith, President of the Section, in the Chair.

Pyosalpinx in an Accessory Fallopian Tube.

By H. Macnaughton-Jones, M.D.

The patient from whom the tumour was removed was aged 38, and unmarried. There was a history of severe pain at both sides of the abdomen which had lasted on and off for several years, with dysmenorrhœa and sometimes menorrhagia. On examination a swelling was found in either fornix, that on the right being considerably the larger.

On opening the abdomen a tumour was found at the right side, which had the round ligament incorporated with it. This proved to be an oval, egg-shaped pyosalpinx, with a cystic ovary adherent to it. The tube and ovary were removed. On exposure of the left adnexa the tube and ovary were found to be normal, but at the upper border of the former, and also incorporated with the round ligament, a tumour was exposed similar to that removed at the right side. This is seen in the specimen.

The patient made an uninterrupted recovery from the operation. It appeared to me at the time that this left tumour was probably a pyosalpinx of an accessory Fallopian tube as described by Handley. Both specimens were submitted for examination and report. The following is Mr. Sampson Handley's report:—

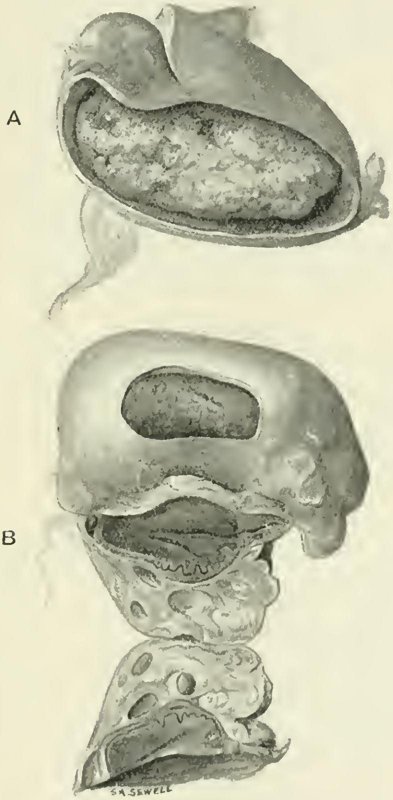
"The swelling removed from the right side of the uterus consists of the ovary intimately adherent to an oval cyst, measuring 2 in. by 1 in. The wall of the cyst is thin and hyaline, and it contains old inspissated pus, in which a granular calcareous deposit has taken place. The closed ostium is seen at the outer pole of the cyst, which must be regarded as an old pyosalpinx. The specimen removed from the left side, on which the tube and ovary were found at the operation to be normal, consists of a pear-shaped cyst, measuring 2 in. by 1½ in., presenting a close general resemblance to the cyst on the right side, and also containing old cretaceous pus. Anatomical landmarks are wanting, but it appears possible that the cyst is an old pyosalpinx of an accessory Fallopian tube.

"*Microscopical Examination.*—The pus in both cysts consists of amorphous granular debris in which no formed elements remain. Cyst on left side: The wall is composed of two layers, an inner one of hyaline fibrous tissue, very poor in nuclei, and an outer one of fibrous tissue arranged in bundles, between which a fair number of nuclei are visible. The cyst possesses no epithelial lining. For two reasons it may be inferred to be of Fallopian origin. (*a*) In the deeper part of the inner layer are a few chink-like spaces, lined by flattened epithelium which are indistinguishable from the subplical spaces of the Fallopian tube. (*b*) In the outer fibrous layer traces of degenerate unstriated muscle can here and there be seen. Cyst on right side: The structure of the cyst wall is exactly similar to that of the left-sided cyst, save that no clearly recognizable subplical spaces can be seen."

May I remind you by a few illustrations of Handley's contention that many of these broad ligament cysts which arise above the tube, some of which may communicate with it, are accessory hydrosalpinges? In these cysts he traced the normal Fallopian structures, in parts altered by hyaline degeneration. Cubical non-ciliated epithelium took the place of columnar until it was absent in the interplical spaces, the muscular structures gradually disappeared, until the wall became merely hyaline fibrous tissue. I have had other similar cysts examined in which the wall was muscular, and columnar ciliated epithelium present.

It may be interesting to recall a few of Handley's specimens shown at the Obstetrical Society, in the Royal College of Surgeons Museum, which are illustrative of these cysts. (These were shown by the epidiascope.) Here also is a specimen of my own, which was reported upon for me by Mr. Handley. The cysts he regarded as of Müllerian origin, replacing the ovarian fimbria at the outer edge of the mesosalpinx. They contain clear, watery fluid. The walls consisted of laminated fibrous tissue, one cyst being lined with cubical epithelium, and the other with a slight layer of columnar epithelium, in parts ciliated.

There was no trace of the ovarian fimbria. Within one of the cysts were vascular projections covered with columnar epithelium which projected into the cysts, and in one part arched over to form a small cavity. The second specimen was also reported on at the time by Mr. Handley. The right and left appendages are seen. On the posterior surface of the right mesosalpinx there were two pedunculated bodies, one fimbriated, the other not. Into the fimbriated a bristle could be passed for a short distance. At the left side there were four small cysts between the layers of the mesosalpinx. There were three distinct ostia to the tube. A small pedunculated cyst is seen springing from the larger one. In another specimen he examined for me the ovarian fimbria was replaced by a large cyst in the free border of the broad



Accessory pyosalpinx. A, left cyst, showing calcareous mass in its interior—accessory tube; B, right cyst (Fallopian tube) and ovary.

ligament. Characteristic plicæ, visible to the naked eye, were found in it. In this instance some smaller cysts were also present, in and near the outer edge of the broad ligament.

Mr. ALBAN DORAN observed that the normal canal of the Fallopian tube could not be obstructed, or otherwise diseased, without seriously interfering with the functions of the generative tract, whilst provided that the cavity of an accessory hydrosalpinx did not communicate with the canal of the tube, suppuration or any other complication might for long lie latent. As it was lined with a mucosa like that of the normal tube, an accessory hydrosalpinx might become the seat of a new growth. As for the little pedunculated cysts in the broad ligaments near the ostium, they, like the fimbriated end of the tube itself, probably arose from the pronephros at a very early stage of development, the pronephros representing the kidney in *Myxine* (A. Keith). The non-pedunculated cyst within the folds of the broad ligament under the ovarian fimbria of the tube, the origin of the so-called "parovarian" cyst, arose, it was now believed, not from the parovarium, the homologue of the epididymis, but rather from embryonic relics representing the rete testis.

Note on a Case of (?) Absence of the Internal Genitalia.

By H. MACNAUGHTON-JONES, M.D.

FROM time to time I have recorded various abnormalities of the external and internal genitalia. Among other examples these records have included a case of complete absence of introitus (a small orifice leading to the urethra), with a rudimentary vagina and uterus, the adnexa being absent; a case of rudimentary uterus, the adnexa present, and the external genitalia normal; one of rudimentary uterus with absent adnexa, the vagina and introitus normal. The present instance, which I bring before you, belongs to the latter class.

The patient's age was 27. She was in good health, the only thing she complained of being some periodical skin eruption of the pemphigus nature. A question of marriage arising, a decision with regard to this had to be arrived at. No thorough internal examination had previously been made. The bowel having been emptied, she was anæsthetized, and bimanual vaginal, recto-vaginal, and recto-vesical examinations were made. The abdominal wall was exceptionally thin, facilitating the examination. I found the external genitalia and vagina normal; the uterus was represented by a nodule a little larger than a pea, and no vestige of adnexa could be felt.

There is a practical point connected with such cases. Naturally, the practitioner dislikes to advise an early vaginal examination, and he treats the primary amenorrhœa by various emmenogogues and other means of establishing menstruation. I have known such a case, after pharmacopœial remedies for every possible cause of the absent menstrual flow were exhausted, sent for a course to a spa. The lesson to be drawn is, that in every instance where there is primary amenorrhœa, and there is no appearance of the catamenia within a reasonable time, an examination should be made under anæsthesia to determine the condition of the genitalia.

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DISCUSSION.

Mr. DOUGLAS DREW referred to a case in which he had operated—a well-developed girl, aged 20, with absence of the vagina. Bimanual examination *per rectum* failed to reveal the presence of a uterus, but a tumour could be felt in the pelvis, which his colleague, Dr. Stevens, suggested might be a horse-shoe kidney. At the operation this proved to be correct; there was no uterus or tubes, the ovaries were present, but were situated high up in the flanks, so that the conclusion that they are absent if nothing can be felt in the pelvis is not warranted.

Dr. MACNAUGHTON-JONES said that exception might be taken to the title of his paper, "Absence of the Internal Genitalia," but in every case he had reported, examination had been made under anæsthesia, and every possible care taken to ascertain if the adnexa were present, both by recto-vaginal and recto-vesical examination. One instance was that of a child, aged 3, and in this, as in two others, he had made an artificial vagina.

Adnexal Tuberculosis: A Study of Twenty-three Cases.

By Frances Ivens, M.S.

Tuberculosis of the female genital organs practically resolves itself into tuberculosis of the adnexa, which occurs in 90 per cent. of the cases [1]. The insidious onset, the not infrequent incidence, and the rapid onset the disease often makes before suspicion is aroused, all point to the necessity for early diagnosis, which is of vital importance if treatment is to be safe and satisfactory. Surgical measures, though more than ever necessary, become much more hazardous when the disease has spread to neighbouring viscera. A secondary infection is almost bound to occur, and left to themselves the majority of such cases are ultimately fatal [4]. When the small intestine is invaded the conditions for surgical intervention are not favourable. Firm union may fail to take place, and there is a risk of leakage, with secondary peritonitis or intestinal fistulæ.

Unfortunately, as pelvic tuberculosis not infrequently occurs in quite young girls, where a pelvic examination is not entertained until general forms of treatment have been tried, the disease has often made considerable headway before its nature is recognized. When suspicion is once aroused, the diagnosis may be obvious. It follows that the possibility of genital tuberculosis should always be borne in mind when with amenorrhœa or irregular menstruation there is vague pelvic pain, not bearing any relationship to the monthly periods. In such cases a rectal examination may reveal the presence of a bilateral pelvic mass. In the twenty-three cases which have come under my care, the genital lesion has been the most striking, but in the absence of post-mortem evidence it is impossible to state with precision that it was invariably primary. In no case was there any active lung trouble, and in only one, Case XI, was there an independent tuberculous lesion present—i.e., tuberculous dactylitis, for which the patient had been originally admitted to hospital. The after-history of this case, which ended fatally in less than a year, supports the view that operation where multiple lesions exist is not likely to be followed by a permanently good result. The only evidence of a previous tuberculous infection was the occasional history of pleurisy or peritonitis.

PORTAL OF ENTRY.

The marked incidence in young unmarried women is evidence against an ascending vaginal infection. There are many indications that the bacilli enter the tubes from the peritoneal cavity, but whether they get there directly from the intestine or through the mesenteric glands is not clear. I have not found tuberculous mesenteric glands in any of these cases. Tuberculous peritonitis was a very definite precursor, and in one instance at least led to tuberculosis of the whole genital tract.

Case XIV.—Mrs. X., at the age of 17, had tuberculous peritonitis, and a large quantity of ascetic fluid was removed by a gynæcologist, who informed me that at that time the peritoneum was studded with granulations but that no tubal infection was noted. Recovery took place, but there was amenorrhœa until the age of 19. The periods, scanty and infrequent for some time, ultimately became regular. The patient married, and about three years later consulted me for excessive leucorrhœa and sterility. I found a slightly enlarged uterus and removed a much thickened endometrium, which on microscopical examination showed giant cell systems. Eighteen months later an indefinite swelling could be felt in the left fornix, and I decided to perform laparotomy. The peritoneum was normal, with the exception of a single adhesion stretching from the omentum to the bladder. The tubes were thickened and a small caseating mass was present in the left broad ligament. Giant cell systems were present, but an inoculation experiment was negative.

In other cases the tubal and peritoneal affection is coincident, but the limitation of the miliary tubercles to the lower abdomen and the immediate neighbourhood of the tubes indicates that infection has spread from the patulous tube. In cases where the tubes are sealed there are no peritoneal granulations. In the following instance plastic tuberculosis of the peritoneum followed within a few weeks of the operation.

Case III.—Mrs. M., married three years, nullipara, had had abdominal pain and an offensive vaginal discharge for three years. Three months before admission amenorrhœa occurred for two months and was followed by hæmorrhage for a month. A swelling was present extending to the umbilicus. Temperature 103° F.; pulse 120. The diagnosis lay between an ectopic pregnancy and a necrobiotic fibroid. On opening the abdomen a hæmatocele was found reaching to the umbilicus, the pelvis being full of solid clot. The left tube and broad ligament were disorganized by hæmorrhagic infiltration, the layers of the broad ligament being separated. In the posterior wall of the uterus was a small necrobiotic fibroid. The uterus was removed with both the appendages, as the right side showed signs of chronic inflammation. There was no suspicion of tuberculosis until microscopical investigation showed giant cell systems in the left ovary. No traces of chorionic villi were discovered. The patient was readmitted a few weeks later with symptoms of plastic peritoneal tuberculosis. A good recovery ultimately took place.

DISTRICT.

The majority of the cases came from the poorest and most densely populated districts of Liverpool, and two from North Wales.

DIAGNOSIS.

In determining the tuberculous nature of these cases, the history, physical signs, macroscopical and microscopical appearances have been considered. I am also indebted to Professor Ernest Glynn for making a number of inoculation experiments. In eighteen there was positive histological evidence. Of eight cases where guinea-pigs were inoculated with caseous material, four acute cases gave a positive result, in two long-standing cases the guinea-pigs died without evidence of tuberculosis, and two gave a negative result. In two cases the specimens were unfortunately destroyed, and in one no operation was undertaken. In one acute case numerous bacilli were found in the pus.

A correct diagnosis was not made in much more than half the cases, the most typical being those of amenorrhœa with abdominal pain and bilateral pelvic tumour occurring in young unmarried women. A history of tuberculous peritonitis was valuable, especially in conjunction with primary amenorrhœa. Diagnosis was especially difficult where the possibility of a previous gonorrhœal infection could not be excluded. Occasionally the nature of the disease was only evident after microscopical examination.

AGE.

The majority of the patients were in the early twenties, the youngest being 18, the eldest 36. In two cases the history pointed to an onset during childhood. Fourteen patients were married, nine single, two marrying after treatment. Sterility was an almost constant feature, and in the married women was of diagnostic importance against the one child sterility of gonorrhœal patients. Two only had each had one child, in both cases many years previously. In Case III there was the possibility of an ectopic pregnancy. In only two cases was the disease unilateral.

MENSTRUATION.

In many cases partial or complete amenorrhœa occurred. In four it was primary, and in all of these a history of a previous attack of prolonged abdominal pain and swelling pointed to tuberculous peritonitis.

Case XXII.—Miss G., aged 25, when aged 6 had a severe illness with abdominal pain and swelling, which kept her in bed many weeks. Menstruation did not appear, but at the age of 18 attacks of abdominal pain occurred every three to six weeks, rarely lasting more than a few minutes, but accompanied by nausea and headache. Caseous foci were present in both tubes, especially at the uterine angles. The left ovary was encased in adhesions and contained a recent corpus luteum.

Case XVIII.—M. D., aged 34, had "peritonitis" at the age of 17, with swelling of the abdomen lasting for months. The periods did not appear, but the patient had good health until two years before admission, when attacks of abdominal pain occurred every fortnight. Both tubes showed chronic tuberculous changes, and in the left ovary was a thin-walled cyst. Great improvement in general health has since taken place.

Case XXIII.—A. S., aged 21, came to the hospital on account of longstanding enuresis, bringing with her a school certificate stating that at the age of 12 she was suffering from "tabes mesenterica." There was primary amenorrhœa, but the patient was well nourished and well developed. The uterus was $1\frac{1}{2}$ in. in length, and a craggy mass of almost stony consistency could be felt under anæsthesia in each fornix. No operation was done, and the patient has since married and is in good health.

Case XV.—Mrs. S., aged 25, for eight years had frequent attacks of sharp abdominal pain. Primary amenorrhœa was present. The patient was thin and anæmic, and an irregular swelling could be felt in the right iliac fossa. The uterus was enlarged, and a mass of cheesy fibrotic material was curetted from the cavity. The right tube was densely adherent and contained a chronic abscess, which was drained. The patient made a good recovery and is now menstruating regularly. As the tube was not removed it is open to doubt whether this case was of a tuberculous nature, but the history and general appearances favoured such a diagnosis.

In nine cases there was partial amenorrhœa, a scanty period occurring at intervals of two or three months. In ten menstruation was either normal or excessive. The onset was occasionally delayed to the age of 19 or 20.

SYMPTOMS.

The onset of the disease is rarely sudden and there is usually a history of failing health with loss of weight and appetite, extending over some months. The patient is easily tired, and does not feel up to her work. Pain in the lower abdomen may occur, not specially connected with menstruation. Amenorrhœa, though frequent, is not a constant feature. Leucorrhœa is almost invariably present. Vomiting, if it occurs, may indicate involvement of the small intestine, or the rapid enlargement of a pre-existing cystic swelling. Abdominal examination may reveal little beyond some deep-seated pelvic tenderness. By the vagina or rectum an indefined irregular mass may be felt in the pelvis, usually bilateral. In slighter cases nodules at the uterine angle, or in the middle of the tube, may be defined. In very chronic cases, the masses may be of stony consistency, and the chief complaint is of chronic pelvic pain. On only two occasions was a large abdominal tumour present. Pyrexia occurred only in the presence of a complication. Painful micturition was not uncommon.

TREATMENT.

Laparotomy was performed in twenty-two cases for the removal of diseased tubes. In two the uterus was removed by supravaginal hysterectomy. In the unilateral cases only one tube was removed, and in all but six it was possible to leave the whole or part of an ovary. Resection of the tube was attempted in the following case:—

Case XXI.—Miss S., aged 23, for three years had complained of pain low down in the right iliac fossa, unrelieved by the removal of the vermiform appendix two years previously. The uterus was retroverted, and a nodular thickening could be felt in the right tube. Firm adhesions round both appendages were found, and the right tube was œdematous, with a firm nodule in the centre. The left showed a similar nodule, was closed, and contained a small amount of clear fluid with calcareous granules in it. The nodule was excised, the cut edges of the tube united with fine catgut, and the fimbriæ separated. The nodules contained giant cell systems. The patient is now in robust health.

In one case of primary amenorrhœa an apparently healthy ovary was grafted into the tubal angle from which a caseous focus had been excised. Menstruation did not follow. Drainage was as far as possible avoided, unless there was a possibility of bowel infection. The neglect of this precaution in one acute case may have contributed to a fatal issue.

Case VI.—L. S., aged 22, complained of weakness, backache, debility, and amenorrhœa of six months' duration. Latterly, occasional vomiting had occurred. In the pelvis was a bilateral irregular tender swelling. The urine contained albumin. Laparotomy revealed a coil of small intestine adhering to the caseating left tube, an adherent pelvic colon, an abscess in the left tube, and a right pyosalpinx. A weak spot in the small intestine was repaired as carefully as possible. All was well until the seventh day, when symptoms of acute pelvic peritonitis supervened. With drainage, the Fowler position, and rectal salines the patient rallied, but died within a month of septic nephritis.

Drainage was of the greatest value in the following case, although complete recovery was slow.

Case II.—Mrs. H., gave a history of metrorrhagia of a month's duration, but presented a healthy and robust appearance. The pelvic colon was incorporated with a granulomatous mass in the position of the left appendages, hardly distinguishable from malignant disease. Extensive suture of the colon was necessary. Owing to the risk of bowel infection drainage was used. From the sinus, pus containing tubercle bacilli poured out for many months, but the patient a year later was in excellent health.

The constant presence of dense adhesions made many of the operations tedious and the value of a free longitudinal abdominal incision was obvious. Good inspection was secured by the use of a Gosnett's retractor.

In the after-treatment tuberculin has only occasionally been used, and did not apparently make much difference to the results.

RESULTS.

Two cases died: (1) on the sixth day, (2) a month after operation.

(1) *Case XVII.*—Miss R., aged 30, gave a history of abdominal pain and swelling of three months' duration. Menstruation was scanty and irregular. The tumour doubled in size during the few days the patient was awaiting admission, and became the size of a seven months' pregnancy. Hæmatemesis started and the tongue was brown. Temperature normal; pulse 120. Laparotomy showed universal dense peritoneal adhesions evidently of long standing. An enormous thick-walled, burrowing left tubo-ovarian cyst containing thick, blood-stained, cholesterin-laden fluid was enucleated with difficulty. The right adnexa were matted, and the ovary contained a caseous focus the size of a walnut embedded in fibrous tissue. Intractable hæmatemesis persisted after operation and the patient died on the sixth day. The cause of the hæmatemesis is obscure, but the nervous and vascular disturbance caused by the rapid retroperitoneal enlargement of such a large cyst must

have been very great. There was no history of gastric ulcer or tuberculous peritonitis, but a severe attack of pleurisy had occurred at the age of 17, and an empyema scar was present.

(2) *Vide supra* (Case VI).

One case survived for less than a year (Case XI), *vide supra*.

After-history.

All but three patients were traced afterwards. Of these three nothing is known beyond their immediate satisfactory recovery from operation. Sixteen have reported themselves as having done well. In one case where at the patient's request the left tube was not removed a second operation was necessary, but her doctor states that she is now in good health. In no case has generalized tuberculosis followed operation, and the fear of this does not seem to be justified.

Several cases have demonstrated the fact that danger is not at an end when the disease becomes apparently quiescent, acute symptoms having disappeared, and caseous foci become encapsuled. Fatal or dangerous complications may result from intra-cystic hæmorrhage or secondary infection. It would appear that removal of the affected organs is the better treatment even with latent disease. The following is an instance:—

Case XVI.—Mrs. O'H., aged 34, married thirteen years, 1-para. Menstruation began at the age of 14, but ceased at 18 for two and a half years, when the patient was four months in an Irish hospital for some abdominal complaint. At the age of 24 she married and had one healthy child. The periods became regular, but were accompanied by severe dysmenorrhœa. Before admission amenorrhœa occurred for three months, and a few days before operation the abdomen began to swell, increasing rapidly in size. The tongue was furred, there was vomiting, dysuria, and pyrexia. An abdominal tumour was present reaching above the umbilicus and situated somewhat to the right of the mid-line. The uterus could not be separated from it. Slight œdema of the vulva and some enlarged inguinal glands were noticed on the operating table. Laparotomy showed the intestines pushed up by a retroperitoneal burrowing right broad ligament cyst, containing masses of lymph and straw-coloured fluid. The tumour was enucleated and several smaller encapsuled peritoneal collections were evacuated. The right tube running in the wall of the cyst showed giant cell systems. Both ovaries contained caseous material, and some of it was inoculated into a guinea-pig, but with negative result. The day after operation a primary sore was detected on the left labium majus.

PATHOLOGICAL APPEARANCES.

Many forms of the disease are present in this series.

Tube.

(1) The attenuated variety where there is little to indicate the nature of the disease beyond the presence in the tubes of adenomyomatous nodules containing giant cell systems (fig. 1).

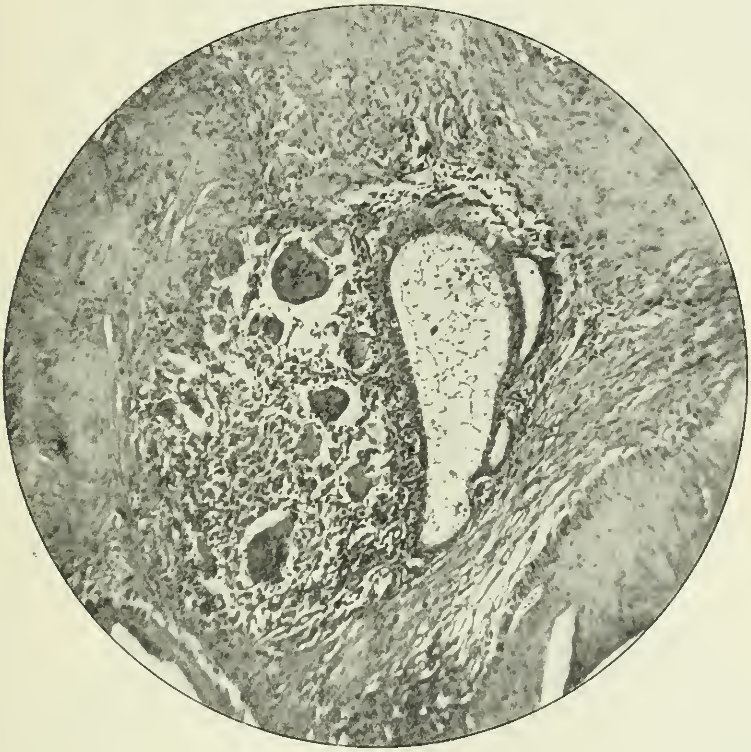


FIG. 1.

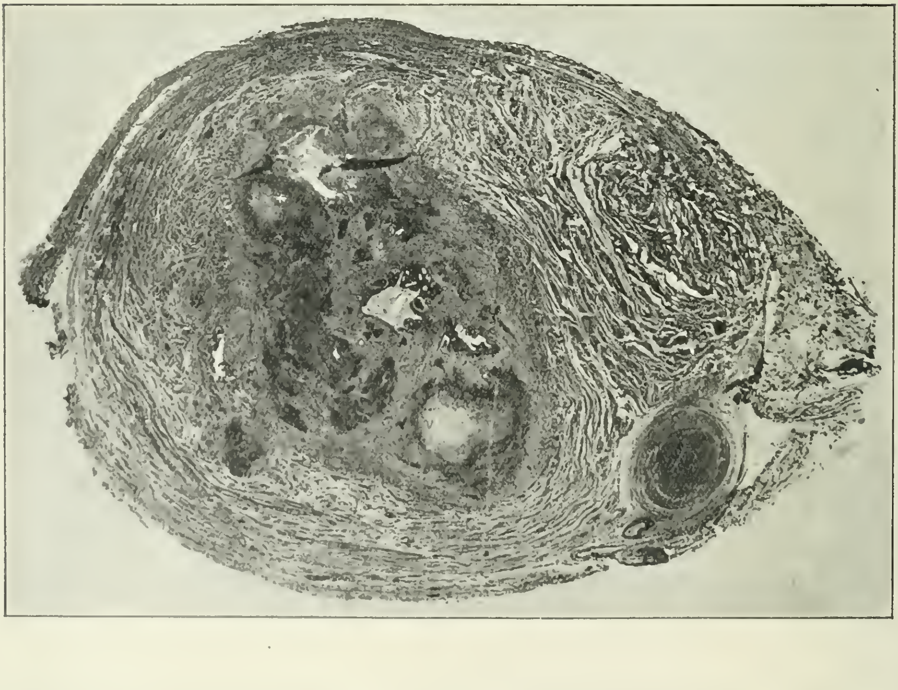
Tuberculous tubal adenomyoma. (× 100.)

(This figure appeared in the *Journal of Obstetrics and Gynæcology*, February, 1911.)

(2) Caseous foci, sometimes calcified, surrounded by dense fibrous tissue. In one case the tube also contained a calcified cast.

(3) Salpingitis in all stages, producing with a closed tube a pyosalpinx, or if patulous associated with peritoneal tubercles in the lower abdomen (fig. 2).

(4) Localized caseous masses near the uterine angle.



[Fig. 2.

Subacute tuberculous salpingitis. (× 9.)

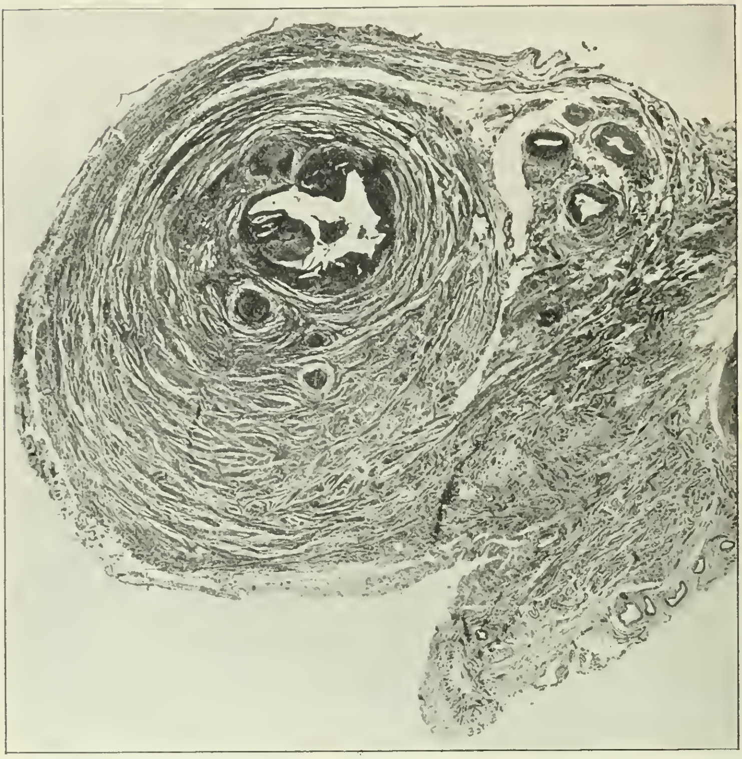


Fig. 3.

Chronic tuberculous salpingitis. (× 10.)

(5) Granulomatous tissue replacing the normal structures, and to the naked eye resembling carcinomatous tissue.

(6) A diffuse fibrotic form with thickened tubes and scanty giant cell systems (fig. 3).

(7) Cases with marked peri-salpingitis.

Ovary.

In eight cases the ovary showed definite tuberculous changes. In nearly every case cysts and adhesions were present.

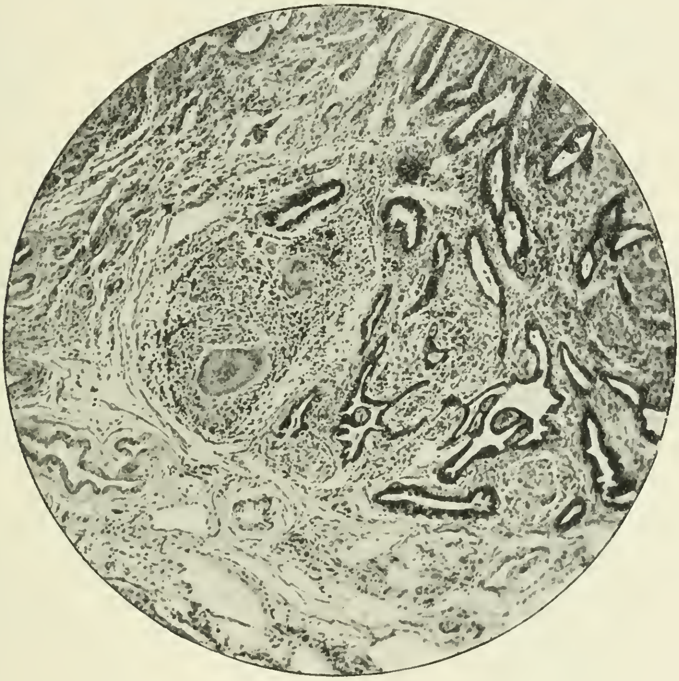


FIG. 4.

Subacute tuberculous salpingitis. (× 75.)

(1) Not infrequently caseous foci encapsuled by fibrous tissue were present in both ovaries.

(2) In some acute cases there were tuberculous abscesses of recent origin.

(3) In one instance granulomatous tissue replaced the normal ovary.

Microscopically the usual histological appearances of tuberculosis are present. In the acute granulomatous forms giant cells abound and there is little caseation. In the more chronic cases the typical giant cell system is seen with commencing caseation, endothelial proliferation and round-celled infiltration (fig. 4).

Case No.		Name	Age	State	Children	History	Menstruation	Symptoms	General condition
I	Left pyosalpinx and cystic ovary; right salpingitis and ovarian abscess	Mrs. A. H., Liverpool (Dr. Witts)	23	M.	None	For some months yellow discharge and profuse painful periods	7/28	Pelvic pain; dysuria	Well nourished T. subnormal, P. 9
II	Bilateral miliary tuberculous salpingo-oöphoritis	Mrs. B., Stockport (Dr. Balmer)	31	M. 6 years	One miscarriage	History of pleurisy; irregular menstruation for a month	5/28	Pelvic pain; uterine hæmorrhage	Healthy and robus appearanc T. 98·4° F P. 84
III	Bilateral tuberculous salpingo-oöphoritis, necrobiotic uterine fibroid, and hæmatocele	Mrs. M., Liverpool (Dr. Boyd)	32	M. 3 years	None	Abdominal pain and offensive vaginal discharge for three years; periods usually regular	Latterly one month's hæmorrhage preceded by two months' amenorrhœa	Abdominal swelling; menorrhagia	Thin, anæmic T. 103° F P. 120
IV	Bilateral tuberculous pyosalpinx	Mrs. A. A., Liverpool	18	M. 5 months	None	Acute abdominal pain and vaginal discharge	Partial amenorrhœa followed by three months' menorrhagia	—	Stout, healthy looking g T. subn mal, P.
V	Bilateral tuberculous salpingo-oöphoritis	Miss S., Waterloo (Dr. Young)	26	S.	—	Loss of appetite and abdominal pain for some weeks	Occasionally amenorrhœa for a few months	Dysuria	Well nourish T. and norma no sign pulmon diseas

ocal condition	Operation	Result	Macroscopic appearances	Microscopic appearances	Inoculation	Remarks
egular mass n pouch of ouglas, in- arable from terus, and mulating a fibroid	Laparotomy, April 15, 1909; right salpingo-oöphorectomy; left salpingectomy; resection of right ovary; no drainage	Primary union	Miliary tubercles over lower peritoneum; no fluid; dense adhesions between vermiform appendix and back of uterus; the closed and thickened left tube contained pus and curled round a large cystic ovary; some pus escaped on separating the right ovary, which also contained blood cysts	Numerous giant cell systems in right tube; endothelial proliferation and round-celled infiltration in left tube	Inoculation not made	In good health some months later, but some dysuria
gular mass left fornix	Laparotomy, Nov. 21, 1909, left salpingo-oöphorectomy; right salpingectomy; suture of sigmoid; drainage *per abdomen;* sinus persisted for a year, but ultimately healed	—	Pelvic colon firmly attached to granulomatous mass in portion of left ovary and tube; tore and had to be repaired; the round and infundibulo-pelvic ligaments were infiltrated; the right tube was closed, thickened and adherent to the ovary	Right tube showed follicular salpingitis with much endothelial proliferation; giant cell systems scattered through left ovary; numerous tubercle bacilli in pus from sinus	—	Sinus persisted for a year but healed, leaving the patient in excellent health
dominal ing reach- nearly to bilicus, s in front, d mass teriorly	Laparotomy, Dec. 17, 1909; double salpingo-oöphorectomy, supravaginal hysterectomy	Abdominal drainage two days	Very large hæmatocele removed; left broad ligament separated and thickened by hæmorrhagic infiltration, and tube disorganized; necrobiotic fibroid in posterior wall of uterus	Tuberculous peri-oöphoritis; areas of round-celled infiltration in tubes and uterus; no chorionic villi found	No inoculation	Readmitted March, 1910, with diffuse pelvic swelling due to peritoneal tuberculosis; recovery after tuberculin treatment by Dr. Owen
er cystic, egular ling in . fornix	Laparotomy, Feb. 26, 1910; bilateral salpingo-oöphorectomy; no drainage	Primary union	Both tubes distended with tuberculous products, and adherent to cystic ovaries; no intestinal adhesions	Wall of tube thickened and mucous membrane replaced by granulation tissue, presenting typical appearance of early tuberculous infection; no caseation	No inoculation	
fluid in oneal ; swell- right uterus erted	Laparotomy, July 23, 1910; evacuation of fluid; right salpingo-oöphorectomy; no drainage	Primary union	Straw-coloured fluid in peritoneal cavity; peritoneum studded with tubercles; uterus and adnexa welded together; right tube contained caseating material; right ovary large and cystic; left tube and ovary adherent, tube opened up and some blood-stained fluid removed; uterus separated	Tubal epithelium shows marked endothelial proliferation; giant cell systems in musculature extending similarly into right ovary	Inoculation not made	Left tubes and ovary were not removed, in accordance with the patient's wishes; her doctor reports: The patient did well for some time, but abdominal swelling and pain recurred and the other appendages were removed; she is now in good health

Case No.		Name	Age	State	Children	History	Menstruation	Symptoms	Genera conditi
VI	Bilateral tuberculous salpingo-oöphoritis and left ovarian abscess	Miss L. S., Bootle (Dr. Baylor)	22	S.	—	Pain in back two years before partially relieved by appendicectomy and Gilliam's operation	Began at 15, was painful; amenorrhœa for six months	Weakness and debility and occasional vomiting	Thin anæm very e citable g ; T. 100°- F., P. 140 ; u contai pus a album
VII	Bilateral tuberculous salpingitis and ovarian abscess	Miss I. D., Liverpool	20	S.	—	—	Began at 15, usually regular; for three months scanty and painful	Severe iliac pain, yellow discharge and dysuria for nine weeks	Healt looking T. 98·4 P.
VIII	Adenomyoma in right tuberculous tube; unilateral	Mrs. F., Liverpool (reported in *Journ. of Obstet. and Gyn.*, Feb., 1911)	24	M. 4 years	None	—	At 15, regular	—	Th anæ compl of bac and g deb
IX	Bilateral tuberculous salpingitis	Mrs. W., Liverpool (Dr. Oliver Jones)	33	M.	None	Menstruation at 14, decreasing for three years; persistent dragging pain in the back	Illness had come on gradually, and the patient hardly knew when it started; had been curetted in another hospital a year previously	Backache; leucorrhœa	W nouri T. a nor
X	Unilateral tuberculous salpingitis	Mrs. R., Seaforth	24	M. 3 years	None	Always fairly healthy	Menstruation infrequent	Pelvic pain; dyspareunia; T. 98° F., P. 84	F nou

Local condition	Operation	Result	Macroscopic appearances	Microscopic appearances	Inoculation	Remarks
Bilateral rregular tender mass in pelvis	Laparotomy, May 20, 1912; right salpingectomy; left salpingo-oöphorectomy; suture of small intestine	Primary union; on seventh day symptoms of acute pelvic peritonitis and toxæmia; offensive fluid evacuated through abdominal wound; drainage	Coil of small intestine adherent to caseous focus in left tube, necessitating suture; pelvic colon adherent, needing repair; right tube nodular, and containing caseous focus; left tube enlarged and adherent to left ovary, which contained an abscess; round ligaments much thickened	Left tube and ovary infiltrated with giant cell systems undergoing caseation; right tube distended with caseous material, giant cell systems in mucous membrane and muscular wall	Inoculation into guinea-pig positive	Fowler position; salines; rallied but died a month later, of septic nephritis
lateral fluc- ating pelvic sses in close onnexion with and separable from the uterus	Laparotomy, June 10, 1909; left salpingo-oöphorectomy; right salpingectomy; resection right ovary; drainage	Union not firm for three weeks, but subsequently healed well	No free fluid; miliary tubercles over pelvic peritoneum; peritoneal cysts; pelvic organs matted, and separation tedious; offensive pus escaped from an abscess in left ovary; thin pus in left tube; the right ovary contained a thick-walled abscess, and was resected, leaving a small portion of ovarian tissue; right tube thickened, containing caseous material	Tubal epithelium replaced by caseous debris; giant cells in ovary	No inoculation	In this case a coli infection was also present, necessitating drainage; menstruation recommenced and was rather profuse; the patient looked well, and married a year later
hickened t tube felt, prolapsed stic ovary	July 23, 1910, laparotomy; right salpingo-oöphorectomy; no drainage	Primary union	Right tube generally thickened, with hard nodule at uterine end; ovary cystic	Adeno-myomatous tissue found in nodule, showing giant cell systems; the wall of the tube shows well-marked giant cells, caseation, and points of calcification	No inoculation	The patient reported herself some months later as being in good health; she had put on weight, and looked well
der mass in pouch Douglas	Laparotomy, Dec. 21, 1911; left salpingectomy; right salpingectomy; no drainage	Primary union	Both adnexa firmly fixed by adhesions; tubes nodular and closed, containing caseous material	Well-marked giant cell systems in both tubes	Guinea-pig inoculation positive	Seen May, 1912, very well except for slight abdominal discomfort; increasing in weight
lling in fornix	Laparotomy, Jan. 14, 1911; appendicectomy; right salpingo-oöphorectomy; resection of left ovary and left salpingostomy; no drainage	Primary union	The right tube was nodular, thickened and closed; right ovary cystic; left tube very slightly thickened, opened and left; cyst in left ovary; appendix short and thick	Caseating giant cell systems scattered through right tubal musculature and mucous membrane	Inoculation not made	Did well

Case No.		Name	Age	State	Children	History	Menstruation	Symptoms	General condition
XI	Bilateral tuberculous salpingo-oöphoritis and left ovarian abscess	Mrs. P., Anglesey (transferred from Mr. D. D. Crawford)	36	M.	One child fourteen years before	Admitted to hospital for tuberculous dactylitis ; menorrhagia for six months	14/28	Dysuria	Thin, anæmic ; T. norma P. 72
XII	Bilateral tuberculous pyosalpinx	Mrs. McK., Bootle	35	M. 5 years	None	Premenstrual dysmenorrhœa, no leucorrhœa ; for the last three months a sharp pain in the right side, beginning about two days before the period and passing off with the flow	There has been increase in the amount lost	—	Well nourishe no sign lung disease T. 98·4° P. 80
XIII	Bilateral tuberculous salpingo-oöphoritis	Mrs. S., Everton, Liverpool (Dr. Joyce)	23	M.	None	—	Profuse, 7/28	Dysmenorrhœa ; gradually increasing pelvic pain of some years' duration	Delica lookin T. 98° P. 80 ; signs pulmon disea
XIV	Bilateral tuberculous salpingitis	Mrs. X., Liverpool	29	M.	None	Attack of tuberculous peritonitis at 17, when ascitic fluid removed, and peritoneum found studded with tubercles ; profuse leucorrhœa followed ; in March, 1910, dilatation and curetting ; well-marked giant cell systems in endometrium	4/28	Leucorrhœa	Thi T. 98·4 P. 8

ocal condition	Operation	Result	Macroscopic appearances	Microscopic appearances	Inocula-tion	Remarks
regular hard ass in pelvis nseparable rom uterus	Laparotomy, Dec. 9, 1909; bilateral salpingo-oöphorectomy; no drainage	Primary union	Peritoneum covered by miliary tubercles; omental filmy adhesions; tubes thick and adherent to back of uterus and pelvic colon; left ovary enlarged and containing pus, which escaped during removal; the right ovary contained blood cysts	Miliary tubercles disseminated through both tubes and ovaries	No inoculation	A secondary case; died a year later
ne uterus is nteverted, nd in the ht fornix is rounded lling of the sistency of dermoid t, and the e of a tan- ne orange; ront of the us, on the ft side, a ller swell- g can be in exami- ion sound ed through oftened rine wall	Laparotomy, June 9, 1913; supravaginal hysterectomy, with removal of both tubes and right ovary	Primary union	No fluid or peritoneal tubercles; the uterus held back by adhesions to the pelvic colon, showing a valvular perforation to the right of the fundus; both tubes distended (retort-shaped) with caseous pus, thickened near the uterine angles; the right ovary enlarged and cystic, both very adherent; the mucous membrane lining the cervix was as far as possible removed; the uterine wall is soft, and the mucous membrane redundant; the yellow thick-walled tubes are filled by pus; the right ovary is cystic	Microscopically, giant cell systems are seen	Inoculation positive; guinea-pig killed Aug. 19; bacilli present in lymphatic gland and liver	Seen Aug. 26, 1913; in good health
teral ten- swelling pelvis; terus overted	Laparotomy, Feb. 10, 1908; right salpingectomy; left salpingo-oöphorectomy; no drainage	Primary union; some cystitis after operation, with one single rise of temperature	No fluid or peritoneal tubercles; omental and pelvic adhesions; tubes thickened but not distended; left ovary size of egg and cystic; gritty caseous material in left tube	Giant cell systems in muscular layer of left tube and points of calcification among folds of mucous membrane	No inoculation	In June, 1908, had tuberculous pleurisy and peritonitis; recovery after three months' tuberculin treatment in Mill Road Infirmary; a year later robust and well; menstruation normal
terus ghtly e rged, ening in e fornix	Laparotomy, Oct. 11, 1911; left salpingo-oöphoritis; right salpingostomy; no drainage	Primary union	Single adhesions from bladder to omentum; left tube thick, nodular and closed; caseating mass in left broad ligament; right tube closed and adherent	Left tube densely fibrosed; mucous membrane at fimbriated end replaced by granulation tissue with calcifying points; right tube contained caseating masses scattered through musculature; giant cells present	Caseous material inoculated into guinea-pig; result negative	Gained weight slightly since operation; periods normal

Case No.		Name	Age	State	Children	History	Menstruation	Symptoms	General condition
XV	Right (?) tuberculous pyosalpinx and caseous endometritis	Mrs. S., Bootle, (Dr. Baylor)	25	M.	None	For the last eight years irregular attacks of sharp abdominal pain, becoming more frequent; a very severe attack came on three weeks before admission, worse in left side and associated with vomiting	Primary amenorrhœa	—	Thin, anæmic patient, looking very ill; T. 99° F., P. 100
XVI	Bilateral tuberculous salpingo-oöphoritis and caseous ovarian foci	Mrs. O'H., Liverpool	34	M. 13 years	One	—	Began at 14, ceased at 18 for two and a half years, when she was kept in Irish hospital for four months with abdominal swelling; became regular again until marriage at 24, periods 3/21 with some dysmenorrhœa; before admission, amenorrhœa for three months, followed by hæmorrhage	Swelling noticed in abdomen a few days before admission; rapid increase in abdominal swelling, with vomiting and dysuria	Fairly we nourishe tongue furred; T. 103° F P. 108
XVII	Left hæmorrhagic tubo-ovarian abscess and caseous focus of right ovary	Miss R., Liverpool (Dr. Hutton)	30	S.	—	For three months abdominal pain and swelling; hæmatemesis for two days; abdominal swelling increased very rapidly during week before admission	Scanty and irregular, 2/44	History of pleurisy at 17; scar on right side of chest	Thin tongu brown T. 98° P. 11

cal conditions	Operation	Result	Macroscopic appearances	Microscopic appearances	Inoculation	Remarks
eneral ten- erness and sistance all er abdomen; welling felt right fornix	Laparotomy, April 15, 1913; appendicectomy; drainage of right pyosalpinx	—	Extensive peritonitis was present; omentum dark or discoloured, adhered to the right tube, which contained pus; the vermiform appendix was adherent, but not obviously diseased; the pelvic organs were densely matted and bound down; as the patient's condition was unfavourable, no attempt was made to remove them, and the right tube was drained; it could be seen that the uterus was considerably enlarged, while the left tube and ovary were small and adherent; the patient made a good recovery and a few days later the uterus, measuring 3½ in., was curetted, caseous fibrous tissue being removed; a good deal of hæmorrhage took place next day	Curettage is organizing fibrous tissue, showing a few ill-formed glands but no giant cell systems	Inoculation negative; cultures negative; guinea-pig died, but not tuberculous	Periods regular after operation; in good health Sept., 1913
ose abdo- al swelling hing well e umbili- , slightly right of idline; erus not able from e elastic lling in e pelvis	Laparotomy, Jan. 6, 1913; bilateral salpingo-oöphorectomy	Pelvis drained by rubber tube; rapid healing	Intestine pushed upwards by large retroperitoneal cyst; peritoneum and cyst wall incised in an area free from vessels and a large quantity of straw-coloured fluid evacuated which contained masses of coagulated lymph; further thick-walled encapsuled peritoneal collections were evacuated and the uterus defined; the large retroperitoneal cyst was enucleated with difficulty; the right tube ran in its wall and was thickened; the adherent right ovary contained a large caseous focus in a fibrous shell; the left was similar; both tubes show tuberculous granulations	Well-marked giant cell systems	Inoculation; guinea-pig died, but not tuberculous	Jan. 7; primary sore and swelling of vulva noticed; Jan. 11, rash
omen nded to f seven nths' ncy by welling	Laparotomy, Oct. 31, 1907; right salpingo-oöphorectomy; left salpingo-oöphorectomy	Drainage	Universal dense peritoneal adhesions; large thick-walled, bluish left tubo-ovarian cyst containing thick dark blood and cholesterin; right adnexa thick and matted; caseous focus the size of a walnut in right ovary; dense fibrosis in cyst wall	Tubes not cut, as cause of condition was not suspected at the time	—	Hæmatemesis continued after operation, and the patient died of exhaustion on the sixth day

Case No.		Name	Age	State	Children	History	Menstruation	Symptoms	General condition
XVIII	Bilateral tuberculous salpingitis	Miss M. D., Colwyn Bay (Dr. Blake)	34	S.	—	Attack of peritonitis at 17, with abdominal swelling for months followed by amenorrhœa	—	Latterly for two years left-sided abdominal pain coming on every fortnight and accompanied by discharge	Fairly wel nourished T. 98° F., P. 84
XIX	Bilateral caseating ovarian foci, and calcified cast of left tube	Mrs. A. D., Liverpool (Dr. Sheldon)	34	M. 6 years	None	Intermittent left pelvic pain for four years, worse on exertion	Scanty, but regular, 1/21	Brownish discharge; pelvic pain	Thin, anæmic, sallow; T. 97° F. P. 90-108 no signs pulmonar disease
XX	Caseous focus of left ovary, chronic tuberculous salpingitis	Mrs. L., Liverpool (Dr. Oliver Jones)	25	M. 1 year	None	Pain in the side for many years	Metrorrhagia for some months	No history of attack of peritonitis obtained	Thin, sallow, anæmic T. 98° F P. 84
XXI	Tuberculous salpingitis and bilateral tubal adenomyomata	Miss S., Waterloo	23	S.	—	Menstruation began at 16, regular, painless, 3/28	Ailing on and off for three years; appendix removed Feb., 1910; no sign of tuberculosis at that time even in peritoneum	Pain of some years' duration in right side of pelvis, which was no better after operation for appendicitis	Thin, pa delicate looking T. 98° P. 84
XXII	Caseating tuberculous salpingitis	Miss G., Liverpool	25	S.	—	At age of 6 had severe illness with swelling of abdomen, in bed many weeks; at 18 began to suffer from attacks of abdominal pain, coming on every three to six weeks, seldom lasting more than a few minutes, but accompanied by nausea and headache	Primary amenorrhœa	Backache and abdominal pain present	Well nourish norma appearar T. 98° P. 84 severe headac and brea- lessnes

ocal condition	Operation	Result	Macroscopic appearances	Microscopic appearances	Inoculation	Remarks
ixed swelling elt in right fornix	Laparotomy, April 17, 1912; double salpingo-oöphorectomy; no drainage	Primary union	Dense adnexal adhesions; thin-walled cyst containing clear fluid in the left ovary; both tubes thickened and ovaries sclerotic	Well-marked giant cell systems in tubes	No inoculation	In good health June, 1913; much stouter
hickening nd tender stic mass in eft fornix	Laparotomy, May 19, 1909; left salpingo-oöphorectomy; right salpingectomy; resection of right ovary; appendicectomy; no drainage	Primary union	Adhesions of omentum and small intestine to pelvis; left tube closed, containing calcifying caseous mass; left ovary cystic, containing caseous foci; in the right ovary caseous foci the size of a grape; no fluid or miliary tubercles, but small intestines glued together by long-standing adhesions	Dense fibrosis of left tube, no giant cells; fibrosis surrounding caseous focus in right ovary	—	Four months later much improvement; gain in weight; menstruation regular; occasional pelvic pain
rregular ass in left fornix	Laparotomy, Dec. 11, 1911; left salpingo-oöphorectomy; right salpingectomy; resection of right ovary; no drainage	Primary union	Firm universal intestinal adhesions and matting of pelvic structures; left tube thickened and closed, containing grumous material; caseous focus the size of walnut in left ovary; cystic right ovary; caseous mass between left tube and ovary	Follicular salpingitis, round-celled infiltration, caseation and some points of calcification; very few giant cells	Inoculation of guinea-pig negative	Seen June, 1913; somewhat improved in appearance; periods regular and rather excessive; no pain
rus retro- ed; small, , irregular elling on it side of is, cyst in ; labium majus	Laparotomy, May 20, 1913; resection of left tube; right salpingectomy; Mayo's operation for retroversion, with separation of adhesions	Primary union; one single rise of temperature after operation (auto-inoculation)	The left tube was closed and slightly distended by thin fluid containing calcareous granules; near the middle was a nodule ¾ in. in length; the ostium was opened and the nodule excised, bringing the two cut ends into apposition; the right tube was swollen and œdematous and contained a similar nodule close to uterine end	The left nodule shows a fibro-adenomatous structure, with some giant cell systems	—	August, 1913; in excellent health
us small l retro- d; a fixed s on the t side of pelvis	Laparotomy, Oct. 23, 1912; double salpingectomy: no drainage	Primary union; left ovary stitched into right uterine angle	Innumerable intestinal adhesions; left ovary encased in adhesions and contained a recently ruptured corpus luteum; left tube closed, thickened, and contained a swelling at the left uterine corner, full of cheesy material; the right tube was in a similar condition	No microscopical examination made, as the specimen was unfortunately lost	Inoculation into guinea-pig negative	—

Case No.		Name	Age	State	Children	History	Menstruation	Symptoms	General condition
XXIII	(?) Chronic tuberculous salpingitis	Miss A. S., Bootle (Dr. Hutton)	21	S.	—	Enuresis and frequent micturition; showed a school certificate stating that at the age of 12 she suffered from tabes mesenterica	Primary amenorrhœa	—	Well nourished normal appearanc and build T. 98° F.

CONCLUSIONS.

It would appear that, excluding those cases of genital tuberculosis which are associated with another active focus, operative treatment is the most generally satisfactory. Although cases not infrequently undergo a spontaneous cure, the tuberculous products, even when encapsuled, may be a source of danger many years later. The removal of even a very chronic tuberculous focus is usually followed by marked improvement in the general health and appearance.

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[1] GOODALL. *Amer. Journ. of Obstet.*, New York, 1907, lv, pp. 800-9.

[2] IVENS. "Notes on Five Cases of Tuberculous Salpingo-oöphoritis" (*Trans. North of England Gyn. Soc.*, October 15, 1909), *Lancet*, 1909, ii, p. 1216.

[3] *Idem.* "Adenomyoma in a Tuberculous Fallopian Tube," *Journ. of Obstet. and Gyn.*, 1911, xix, p. 266.

[4] SIMMOND. *Arch. f. Gyn.*, Berl., 1909, lxxxviii, pp. 29-59.

DISCUSSION.

Dr. BRIGGS alluded to the chronic character of the tubercular disease in Miss Ivens's cases; this circumstance suggested a summary five years hence. In more acute cases, showing, in their course, a close clinical resemblance to typhoid fever and one or many relapses, there were imperative demands for operation on the diseased appendages. In the majority of patients there were active tubercular foci elsewhere, and the aggravation or relief by operation could not be locally governed.

Mr. DOUGLAS DREW said that with a considerable experience of operations for tuberculous peritonitis in children, he had not met with a case in which there was disease of the tubes; in Miss Ivens's cases an antecedent tuberculous peritonitis appeared to be of not infrequent occurrence. Mr. Drew asked in what percentage of the cases recorded a tuberculous endometrium was present,

cal condition	Operation	Result	Macroscopic appearances	Microscopic appearances	Inoculation	Remarks
erus 1½ in. n length ; d, egg-like ass felt in h fornix of nost stony nsistency ; ne 23, 1908	The vesical condition improved with treatment, and as the patient did not complain of any pelvic symptoms, no operation was done	—	—	—	—	Seen in June, 1912, in very good health ; came up to report herself as she was staying in the neighbourhood ; had been married for a year ; still amenorrhœa ; no pregnancy

and suggested that it was probably of frequent occurrence, and if so, it appeared to recover spontaneously after the main lesion was removed.

Dr. MACNAUGHTON-JONES said that a few years back he had read in the Section a communication of "Primary Tuberculosis of the Fallopian Tube,"[1] and had shown three specimens. Two of these patients were now in good health. In one of these, in whom the affection was unilateral, he had removed the opposite adnexa nine years subsequent to the first operation, and careful search had been made for any evidence of tuberculosis, but none could be found. In the interval the patient had had four pregnancies, including a twin one. Two of the specimens were reported upon by the late Mr. Targett, and one by Dr. Cuthbert Lockyer. He thought that tuberculosis of the genitalia was more frequent than generally recognized. When he published his paper in the *Edinburgh Medical Journal*[2] a few years back, he collected all the statistics which had been published by Murphy in America, as also those published on the Continent. They included the records of several thousand cases, and it would appear that from 8 to 9 per cent. were of a tubercular nature. Seeing the difficulty of diagnosis, when suspicions arose of tuberculosis in a young person, every test as to its presence should be tried. The greater number of Miss Ivens's patients were under 30 years of age. An important point also was that some 40 per cent. of the patients were practically well some considerable time after operation.

Miss IVENS, in reply, stated that her cases included types of both active and chronic disease. Tuberculous endometritis had been found once, but systematic curettage had not been practised as leucorrhœa tended to disappear after removal of the diseased tubes. It was possible that in cases where tuberculous peritonitis had occurred in childhood the infection remained latent, to become active with the onset of puberty. Miss Ivens thanked the speakers for their remarks and was grateful for the criticism of that eminent authority on pelvic tuberculosis, Dr. Macnaughton-Jones.

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[1] *Proceedings*, 1908, i. pp. 177-87.

[2] *Edinb. Med. Journ.*, 1904, lviii, pp. 103-22.

The Serum Diagnosis of Pregnancy.

By R. L. MACKENZIE WALLIS[1] and HERBERT WILLIAMSON, M.D.

PART I (BY R. L. MACKENZIE WALLIS).

THE formation of ferments in the blood after the introduction of foreign substances from without forms the basis of the two tests devised by Abderhalden for the diagnosis of pregnancy. He called attention to the existence of such ferments in the year 1906, and since then has elaborated methods for their detection, and utilized these for the diagnosis of various conditions. Recent advances in our knowledge of the assimilation of digested foodstuffs from the alimentary canal have brought to light the fact that only those bodies which constitute specific cell structure are normally taken up into the blood-stream, and utilized by the body cells. The introduction of foreign materials from the alimentary tract excites ferment changes in the blood which have a special character. An example of such a change is provided when cane-sugar is introduced parenterally into an animal. There is an increase in the ferment invertin which destroys the cane-sugar, as this would otherwise be excreted unchanged. Proteins of the higher molecular types, when introduced either subcutaneously or intravenously, similarly excite the production of a proteolytic ferment which rapidly destroys them. The same observation applies to the increase of fat-splitting power of the serum after an excessive absorption of fat from the intestine.

It will be seen, therefore, that not only does the foreign body give rise to the ferment production, but the ferment so produced has a specific nature. Abderhalden, working upon this basis, has devised methods which are applicable to other normal and pathological conditions, and the earliest investigations were made upon the diagnosis of pregnancy. The two tests, known respectively as the optical method and the dialysation method, have been subjected to a very thorough examination in the hands of Abderhalden and his co-workers in

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[1] Work done during the tenure of the Gillson Research Scholarship in Pathology, Society of Apothecaries, London.

Germany, and an extensive literature has already accumulated upon this subject. In the present communication I propose to confine myself to giving an account of the methods, with improvements in technique, and also the observations made. Dr. Williamson has kindly consented to give an account of the value of the tests from the clinical standpoint, and I would here express my indebtedness to him for providing me with some of the cases, and also for the interest he has taken in the work.

The Optical Test.

The growing placenta is regarded as the agent providing the foreign protein substances which excite the production of a protective ferment in the maternal blood-stream. Owing to its proteolytic nature we are enabled to recognize the breakdown products, and these are the essential factors in both the tests that are to be described. The materials necessary are first of all the blood serum of the patient to be examined, and a supply of fresh human placenta. The optical test requires the use of a good polarimeter capable of giving readings below 0·01°, and in addition special polarimeter tubes for maintaining a constant temperature. After some practice the readings are readily made, and differences of rotation determined. The material used for the substrate upon which the ferment in the serum of pregnant women acts is a solution of placental peptone. This is prepared by the digestion of placental proteins with acids, the hydrolysis being allowed to proceed to the stage of peptones, and then arrested. The placental peptone is prepared as follows: Fresh human placenta is carefully washed free from blood with salt solution, and then thoroughly macerated. The residue is treated with sulphuric acid, and allowed to remain at room temperature for four days. The acid slowly hydrolyses the proteins present, and this change is arrested on the fourth day by the addition of several volumes of distilled water. The sulphuric acid is then removed by the quantitative addition of baryta water and the resulting dense white precipitate separated by filtration. This barium sulphate precipitate is ground up in a mortar with distilled water, and the decanted and filtered extracts collected. The extracts must now be carefully freed from all traces of acid or barium hydrate, otherwise the hydrolysis would proceed further, and the yield of peptone considerably diminish. The extract is now concentrated in a large distilling flask heated over a water-bath and in order to prevent frothing the peptone mixture is introduced in small quantities at a time. A thick syrup possessing a yellow colour finally results, and this is dissolved up in warm methyl alcohol. The placental peptone may then be thrown out of solution by absolute alcohol as a fine powder, which is readily soluble in water. For the polarimeter test a 5 per cent. solution of this peptone in salt solution is used and this is placed in a sterile flask and kept sterilized ready for use. All the materials used throughout the work are also sterilized.

Into the polarimeter tube 1 c.c. of the placental peptone solution is placed, and 1 c.c. of the clear serum to be tested. The remaining space is filled with salt solution, and the tube is now ready for insertion into the polarimeter. The solution always shows a lævo-rotation, and the actual rotation is noted. The tube and its contents are now placed in an incubator at 37° C., and at the end of one hour another reading is made. The tube is replaced in the incubator and examined at intervals of from six to eight hours, the observations not extending beyond forty-eight hours in all. As far as possible it is advisable to use the same volume of the serum in every test, and the size of the polarimeter tube must not be altered as otherwise comparable results are not obtained. The splitting of the placental peptone into amino-acids produces an alteration in the optical activity of the solution, and the amount of rotation gives an indication of the activity of the ferment present in the serum. A difference of rotation below 0·05° is disregarded, the serum of pregnant women usually producing a rotation of at least 0·2° and even higher.

The Dialysation Method.

The optical method has been proved by Abderhalden to demonstrate the presence of a specific ferment in the blood of pregnant animals. The dialysation method has consequently been devised to detect the end-products resulting from the splitting of placental protein outside the body. For the dialysation test a preparation of placental tissue is required, and this is prepared in the following way: A fresh placenta from a normal case of labour is obtained and carefully cleaned with tap-water, or saline. The fœtal surface and also the membranes are cut away, and the remaining tissues cut up in small pieces and washed in running tap-water until every portion is quite white. This washing is absolutely necessary as the placental tissue must be quite free from blood before use. The pieces of tissue are placed in a large basin containing about ten times their volume of distilled water and two drops of glacial acetic acid, and then boiled for ten minutes to coagulate the proteins present. The coagulated placental albumen is thoroughly washed with cold distilled water, and again boiled in the same volume of water as before. The water is now tested with the ninhydrin reagent to determine whether any dialysable substances are still present in the placental tissue, as these would produce a serious error and completely invalidate the test. The ninhydrin test is made upon 10 c.c. of the water with 0·2 c.c. of a 1 per cent. solution of ninhydrin, the mixture being boiled for one minute. A positive test points to the presence of dialysable substances, but in most cases these are usually absent at this stage. The tissue is again washed in distilled water, and then heated with five times its volume of distilled water. In order to detect even smaller amounts of dialysable substances 5 c.c. of the water are tested with 1 c.c. of ninhydrin solution, the test being frequently positive with this amount. The distilled water generally contains small fragments of placental tissue, so that before applying the ninhydrin test to any sample of the washings it is first of all necessary to filter. When the ninhydrin test proves negative the placental tissue is placed in a glass vessel containing chloroform water and covered with a layer of toluol, and stored in a cool place until required. The tissue before actual use in a test is again subjected to boiling in five times its volume of distilled water until a negative ninhydrin reaction is obtained. It is only in this way that we can exclude dialysable substances in the placental preparation which interfere with the test. The writer has also found it necessary to make fresh preparations of placental tissue at frequent intervals, as the stock material cannot always be relied upon. The placental tissue is obviously one of the most important factors in the test and the greatest source of error, hence the necessity of exercising the utmost care during the steps in its preparation. The dialysers used in the test are those specially prepared by Schleicher and Schüll, and labelled No. 578A, the size most suitable for ordinary use being 16 by 50 mm. These dialysers are allowed to soak in distilled water containing toluol for some days and then tested as to their capability of separating peptones and amino-acids from colloidal substances. For this purpose a preparation of peptone is required, that used by Abderhalden being the "seiden" peptone.[1] Five cubic centimetres of a 0·1 per cent. solution of peptone are placed in a dialyser tube, and surrounded by 20 c.c. of distilled water, contained in a special glass vessel, all the materials being previously sterilized. The vessel is then placed in an incubator for sixteen to twenty-four hours and 10 c.c. of the dialysate tested with 0·2 c.c. of a 1 per cent. solution of ninhydrin. A dialysing tube giving a moderate blue colour is accepted as reliable, those giving either a very strong reaction or a negative result being discarded. After passing this test they are carefully washed in distilled water for some weeks and tested in the same way with serum albumen or egg albumen, only those giving a negative ninhydrin test being used. The dialysers can be used repeatedly, provided they are subjected to careful washings after each test, and stored in distilled water containing toluol as a preservative. The glass vessels used for the test are provided with ground glass stoppers, and they should be of such a size that when the dialyser is in place there is a space of 0·5 cm. between the dialyser and the vessel wall. For the test the glass vessel contains 20 c.c. of sterile distilled water covered with a layer of toluol. The serum is obtained in the same way as described for the polarimeter test, and must be quite fresh, as otherwise the slightest hæmolysis in the serum is sufficient to produce an erroneous result. The removal of 10 to 15 c.c. of the patient's blood from the median basilic vein when carried out with the usual precautions and the transference of the blood directly into a sterile centrifuge tube generally avoids these sources of error. Since the blood serum may contain dialysable substances in the form of amino-acids after meals, it is always advisable to remove the blood some hours after a meal. The writer has also found it preferable to take the blood in the evening, as the dialysable substances tend to be reduced in amount when the body is fatigued. The ninhydrin reagent (triketohydrindene hydrate) is now manufactured and sold in 0·1 grm. tubes, in the form of a yellowish-coloured salt, which is readily soluble in water, giving a colourless solution. The solution used in the dialysation test is made up to a strength of 1 per cent. This compound reacts with any amino compound where the amino group is in the *a* position to the carboxyl group, the resulting condensation compound possessing a blue colour. The ninhydrin solution should be kept in the dark, and properly sealed, as the reagent rapidly deteriorates, and further, it is advisable not to keep the solution longer than one week.

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[1] The writer has used a peptone solution made from "Darby's fluid meat."

Method of Applying the Dialysation Test.

A series such as the following is made up in carrying out the test for the diagnosis of pregnancy:—

(1) Serum of patient (1 c.c).
(2) Serum of non-pregnant woman (1 c.c.).
(3) Heated placental tissue (about 1 grm.).
(4) Heated placental tissue + 1 c.c. serum of patient.
(5) Heated placental tissue + 1 c.c. serum of non-pregnant woman.
(6) Heated placental tissue + 1 c.c. serum of patient heated to 60° C. for thirty minutes.

In the actual tests 1 c.c. of serum is placed in a properly tested dialyser together with a small quantity of the placental tissue, and the dialyser surrounded by 20 c.c. of sterile distilled water, toluol being added to both. The whole series of tests as given above is placed in the incubator at 37° C. and allowed to remain for sixteen to twenty-four hours. At the end of this time they are taken out and the dialysates examined separately with the ninhydrin reagent. During the earlier stages of this work the biuret test was used to demonstrate the presence of peptones in the dialysate, but since the introduction of the much more delicate reagent of Ruhemann known as ninhydrin, the former test has been discarded. To carry out the biuret test a solution, made up from a 30 per cent. solution of sodium hydrate and a very dilute solution of copper sulphate, possessing only a faint blue colour, is used. The solution is placed in a reagent glass, and the addition of the dialysate produces a blue ring at the junction of the fluid. Test No. 4, however, should always give a blue colour indicating a positive reaction.

The ninhydrin test, on the other hand, owing to its extreme delicacy requires much more careful manipulation, and further is full of pitfalls. Ninhydrin is triketohydrindene hydrate, and when heated with peptones and amino-acids forms condensation compounds which possess an intense blue colour. The sensitiveness of this reagent depends upon the concentration of the substances present, and will show the presence of the amino-acid glycine in one part in 65,000 of water, and one part of the other amino-acids in 15,000 to 25,000 of water. Further, every protein and protein-containing material will on dialysis give this test—*e.g.*, fresh milk, saliva, urine, blood plasma, lymph, sweat, fresh and boiled egg white, fresh and cooked meat, although containing no biuret-yielding bodies. From this list of substances alone, it will be clear that all proteins must be purified by dialysis before use. Further, the materials used in the test must not be handled with the fingers, and pipettes must not be placed in the mouth, owing to the danger of contamination with the saliva. Since hæmoglobin is a diffusible protein when free, it follows that hæmolysed serum cannot be used for the diagnosis of pregnancy.

The solution is made up in distilled water to the strength of 1 per cent., and it is advisable to use moderately fresh solutions as the reagent does not keep well. To carry out the test 10 c.c. of the dialysate are placed in a clean sterile boiling tube, and 0·2 c.c. of ninhydrin solution added. The mixture is then boiled for one minute, a boiling stick being inserted to prevent frothing. A positive result is indicated when the solution assumes a blue colour. Carried out in this way the dialysation method gives results which always confirm the optical tests, and provided attention is paid to the details of technique the test is of value in the diagnosis of pregnancy. Alone, however, the test cannot be said to be of absolute value as there are still fallacies over which we have no control. As shown above, the sensitiveness of the reagent depends upon the concentration of the reacting substances. Now if we assume that one unit of substance is required to give the blue colour, the dialysate from the serum of pregnant women must contain one unit or above. In the crucial test we are using two materials, namely, serum and placental extract. The serum may contain only 0·5 unit, and so give a negative reaction when dialysed alone, and similarly the placental tissue may yield 0·5 unit. When, however, the two solutions are mixed together one unit of dialysable substance is obtained without any actual ferment changes taking place, and a positive test results. Again, a serum which has been obtained after a meal will contain an increase of diffusible substances as much possibly as 0·9 unit, and this when mixed with the placental tissue will also give a positive test. Such results have been met with, and a number of experiments has been made in an attempt to eliminate this error.[1] All that can be said at present is that certain definite rules must be laid down before applying the test. In the first place the patient must have abstained from food at least four hours previously, and the blood is best taken late in the day, as when the body is fatigued the blood contains less of these diffusible substances giving the ninhydrin reaction. The placental tissue also requires careful preparation, and particularly long-continued dialysis before use.

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[1] To a certain extent this possible source of error is overcome by inactivation of the serum, as in experiment (6) in the series given above.

The sensitiveness of the ninhydrin reaction depends upon the concentration of the dialysate, and also of the reagent itself. The dialysate from all the tests, therefore, requires boiling for exactly one minute, and the same gas flame must be used so that evaporation is constant in all. The best method of checking this is to use specially graduated test-tubes for the ninhydrin test, and the amount of fluid left in each tube after boiling should be compared.

That placental tissue plays a prominent part in the production of a protective ferment has been proved conclusively by Abderhalden, by a number of animal experiments. The serum of a pregnant animal can be inactivated by heating to 60° C., thus demonstrating that the ferment is destroyed by exposure to this temperature. The serum of the fœtal blood and also fœtal tissue do not contain this ferment. An extract of human placental tissue in salt solution, and also human placental peptone were injected into dogs, rabbits, and guinea-pigs, either intravenously or intraperitoneally, the blood serum of normal animals mixed with placental peptone being also used. In the case of the dogs, two injections of 1 grm. of placental peptone were given on successive days, and the blood collected eight days afterwards, and the serum tested against placental peptone by the optical method. In every case a breakdown of the placental peptone occurred. The rabbits received four intravenous injections of 2 to 3·5 c.c. of placental extract, and six days afterwards the serum when tested gave a similar result. The same changes occurred in guinea-pigs after injections of 0·6 c.c. of placental extract into a shin vein. These results conclusively proved that a ferment is present in the blood serum of pregnant animals, and capable of detection by the optical method. The presence of this ferment in the blood-stream was also confirmed by dialysis experiments.

The results obtained when using these methods of Abderhalden tend to demonstrate that the tests are of great value, provided the technique is perfect. The clinical notes of some of the cases which I have examined with a view to assisting in the diagnosis of pregnancy have been made by Dr. Williamson, so that it is unnecessary to refer to them here. My chief object is to demonstrate the procedure adopted, and to show that when the technique of the observer has been perfected the results obtained justify the labour expended. During the past eighteen months I have been engaged in subjecting this test to a thorough examination and perfecting my methods. The test appears to be of value more especially in the following conditions :—

(1) The early diagnosis of pregnancy.
(2) The differential diagnosis between fibromyomata and pregnancy.
(3) The diagnosis of chorionepithelioma.

In cases of fevers and in patients with cachexia, the serum probably contains an increased amount of dialysable substances, and this may lead to a source of error. The two cases of tuberculous hydrosalpinx probably owe their positive dialysation tests to such substances present in the serum, and unfortunately the optical test was not applied in these two instances.

PART II (by Herbert Williamson, M.D.).

Clinical Aspects.

When I first read Abderhalden's papers it seemed to me a matter of great importance to test the correctness of his observations. If it be true that the blood of a pregnant or recently delivered woman contains a ferment specific to placental albumen, if this ferment is constantly present and can be easily demonstrated, if the sources of error are few and can be readily avoided, the test possesses great value in both clinical and forensic medicine. It is obvious that such an investigation can be carried out only by one possessing a wide knowledge of pathological chemistry, and I therefore asked Mr. Mackenzie Wallis to undertake the matter. The results of his admirable work have been placed before you in the paper just read, and it remains for me to add a few remarks upon the clinical aspect of these observations. In the first place they support strongly the theory of a ferment specific to placental albumen present in the blood of women, from the eighth week of pregnancy until ten days after delivery. The ferment is not formed in the placenta, but is elaborated in the maternal organism for the purpose of reducing into simpler molecules the masses of chorionic albumen which constantly pass into the mother's blood-stream. The intravascular injection of any foreign albumen leads to the production of specific ferments, and a similar result follows the injection of other substances, as for example, cane-sugar. It is obvious, therefore, that the test is capable of wide application and may be used for the detection of carcinoma and other forms of new growth. It has been applied for this purpose in a number of cases under my care, but I propose to confine my remarks to the diagnosis of pregnancy.

The test has been applied to fifty patients as a control. Of these, twenty women were either in the last three months of pregnancy or had recently been delivered. In each case the result was positive. It was applied to thirty women who were not pregnant—in all thirty patients the reaction was negative. This series of results demonstrates the importance of further investigation of the test, and I propose to-night to describe briefly sixteen cases in which it was applied for diagnostic purposes. I have fortunately been able to follow the history of all the patients; in twelve the deduction drawn from the test proved correct, in two it proved wrong, and in two the result still remains in doubt. The cases are as follows:—

Suspected ectopic gestation	3
Pelvic and abdominal tumours where it was suspected that the whole or part of the tumour might be the pregnant uterus	5
Suspected chorionepithelioma	2
Chorea in a woman, aged 21	1
Heart disease with amenorrhœa	1
Nephritis with exacerbation of symptoms and amenorrhœa	2
Late puerperal sepsis...	2

In all cases where the optical test was used and confirmed the dialysation experiments the result is indicated by an asterisk.

(1) *Cases of Suspected Ectopic Gestation.*

Case I.—The first case was that of a woman who had previously borne two children, the last two years ago. She stated that her periods had been perfectly regular in both time and duration, and that the last had ceased on June 3, 1913. On June 5 she suddenly lost 4 or 5 oz. of blood, and from that time there was a small daily loss up to the time of her admission on June 27. On June 8 she suffered an acute attack of abdominal pain lasting one and a half hours, and similar, though less severe, attacks were experienced on June 10 and June 17. There had been no nausea or vomiting, and no secretion would be expressed from the breasts. Above the left Poupart's ligament was a tender indefinite swelling, and the uterus, of natural size, lay in the midline behind the symphysis pubis. Clinically the diagnosis was between an inflammatory mass and an ectopic gestation. Abderhalden's test gave a positive result. Operation revealed a gestation sac in the left Fallopian tube with a broad ligament hæmatoma.

Case II was that of a patient admitted into a surgical ward under the care of Mr. Wilson. After six weeks' amenorrhœa in a woman whose periods had for some time been irregular, a sudden attack of abdominal pain, associated with vomiting and collapse, led to her admission to hospital. The breasts were inactive, and pelvic examination revealed nothing abnormal. Abderhalden's test gave a negative result.* Within two days the patient appeared quite well, and has remained so since. I examined her a month later and found no evidence of any pelvic lesion.

Case III was that of a woman who had been married nine years and had never been pregnant. On June 19 she was seized with acute abdominal pain associated with retching and vomiting, and within two hours commenced to lose blood *per vaginam*. The breasts were inactive, the uterus of normal size lay behind the right pubic ramus, and a tender indefinite swelling occupied the left posterior quarter of the pelvis. Abderhalden's test gave a negative result. At operation I found a hydrosalpinx of the left tube with torsion of the pedicle.

From this experience I think Abderhalden's test is of value in the diagnosis of doubtful cases of ectopic gestation, but it must be remembered that in the event of rupture and death of the ovum within the first six weeks a negative result would probably be obtained.

(*II*) *Abdominal and Pelvic Tumours of Doubtful Nature.*

This group includes five cases:—

Case I.—A woman, aged 37, who had been married for thirteen years and had never been pregnant, came to hospital complaining of a swelling in the abdomen. There was a history of menorrhagia for five years, but for the last seven weeks there had been amenorrhœa. On examination a tumour was discovered rising from the pelvis and reaching to the level of the umbilicus. The greater part of the tumour was clearly a uterine fibromyoma, but in view of the history of amenorrhœa, although I could detect no signs of activity in the breasts, or softening of the cervix, I suspected that she had probably become pregnant. Abderhalden's test proved positive.* I saw the patient six weeks later, and then the signs and symptoms of pregnancy were clearly marked.

Case II.—A patient, aged 35, was admitted into hospital on account of an acute attack of abdominal pain. On examination two tumours were discovered, the one a thin-walled ovarian cyst, the other the uterus enlarged to the size of three months' gestation. Menstruation had been regular and no signs of pregnancy were detected. Abderhalden's test gave a negative result.* At operation the uterine tumour proved to be a soft fibromyoma.

In *Case III* the test gave a misleading result. This was probably due to an error in technique, for when repeated the test proved negative. The patient was admitted under the care of Dr. Griffith, on June 27, 1913. The menstrual periods were regular until February, 1913, and from this date were absent until May 6, when there was slight bleeding for four days, after this there was again amenorrhœa up to the time of admission. On June 17 she felt ill, and suffered severe pain over the right iliac fossa; this pain gradually diminished, but had not entirely ceased. On examination the right breast contained clear secretion, and a cystic mass was detected rising out of the pelvis and reaching to the level of the umbilicus, situated mainly to the right of the middle line. Abderhalden's test gave a positive result. At operation the mass was found to consist of a uterine fibromyoma, a suppurating ovarian cyst and a pyosalpinx.

Case IV.—A woman, aged 36, sought advice because she had not seen her periods for three months. She had previously borne two children, but did not think she had again become pregnant because there had been no morning sickness, and she had noticed no change in the breasts. On examination a fluid tumour was discovered rising out of the pelvis and reaching to $1\frac{1}{2}$ in. above the navel. The uterus could not be definitely identified apart from the tumour, and the diagnosis therefore lay between hydramnios and an ovarian cyst. Abderhalden's test was negative.[*] At operation the tumour proved to be an ovarian cyst.

Case V was the second of the two in which the test gave an erroneous result. The patient, a girl, aged 19, was admitted into a medical ward under the care of Dr. Howard Tooth. Menstruation had been irregular, periods of rather profuse bleeding alternating with periods of amenorrhœa. She gave a history of several attacks of severe abdominal pain. The temperature was raised, sometimes reaching 102° F. at night, and the girl was obviously very ill. The abdomen was distended, and a centrally situated mass of irregular outline was felt rising out of the pelvis; vaginal and abdominal examination were extremely difficult on account of tenderness. The case appeared to be one of tuberculous pyosalpinx, but Abderhalden's test was tried, and to my great surprise proved positive. At operation I found bilateral tuberculous pyosalpinx.

It is interesting to note that the two cases in which the dialysation test proved fallacious were cases of suppuration within the abdominal cavity; this suggested the advisability of ascertaining whether a similar result was common in suppurating cases, but the controls we have made do not support this view.

(*III*) *Chorionepithelioma.*

Case I.—A patient, aged 39, was admitted into hospital on August 2, 1913. She had previously borne two children, and on February 1, 1912, was delivered of a hydatidiform mole. In March, 1912, a pelvic abscess was opened *per vaginam*, and the patient made a rapid recovery. Menstruation was re-established in April, 1912, and the periods were regular until April, 1913; from that time until her admission into hospital there had been amenorrhœa. In July, 1913, she commenced to suffer from pain in the abdomen which gradually increased in severity, and on two occasions there was hæmoptysis. On admission the patient was deeply jaundiced, the movements of the chest were restricted, the air entry was poor, and scattered râles were heard. The liver was markedly enlarged; the lower abdomen was distended by a centrally situated elastic tumour rising from the pelvis and reaching to within an inch of the umbilicus, dull on auscultation and non-contractile. The cervix uteri was high in the pelvis, and behind it was an elastic mass occupying the pouch of Douglas. The case was apparently one of malignant pelvic growth with metastatic deposits in the lungs and liver, but seeing that seventeen months had elapsed between the expulsion of the mole and the onset of symptoms, I did not feel certain that the growth was a chorionepithelioma. Abderhalden's test proved positive.* At post-mortem examination a chorionepithelioma of the uterus with secondary growths in the lungs, liver and intestine was discovered.

This case suggests the importance of subjecting at regular intervals to Abderhalden's test all patients who have borne a hydatidiform mole. Should a chorionepithelioma develop, the test ought to remain positive instead of becoming negative in a few days as after a normal pregnancy; in this way it is probable that we may obtain evidence of the development of the malignant growth some time before it can be recognized clinically.

We are adopting this procedure in the following case: A lady was delivered of a hydatidiform mole on February 11, 1912, after four months' amenorrhœa. I was asked to see her on March 26, and found the uterus well involuted and the cervix closed. Behind the uterus was a tender irregular body, rather larger than a tangerine orange, partly cystic and partly solid, probably a lutein cyst of the ovary. The positive Abderhalden test first obtained was probably due to the presence of diffusible substances in the blood, for the control was also positive, and we have since discovered that a meal had been eaten one hour before the blood was taken. When the test was repeated with proper precautions the result was negative.

It is interesting to note that the optical test was negative on both occasions. I am feeling some anxiety about this patient, and am doubtful whether I ought not to advise immediate exploration of the uterus.

(IV) *Chronic Nephritis with Exacerbation of Symptoms.*

Two such cases have been tested; there was no doubt whatever from clinical evidence that both were pregnant, so that the application of the test was for the purpose of control rather than of diagnosis. The result in both cases was positive. On clinical grounds, chiefly because of the development of a marked acidosis, I regarded both cases as instances of the grafting of a pregnancy toxæmia upon an old nephritic lesion. We must, I think, be prepared to recognize that the discovery of the presence of ferments specific to placental albumen in the blood of pregnant women opens a new chapter in the pathology of pregnancy toxæmia, but how far the lesions may be attributed to a failure of production or to undue abundance or activity of ferments are questions which have yet to be investigated.

(V) *Late Puerperal Sepsis.*

The test may prove of value in cases of late puerperal sepsis where it is uncertain whether the uterus still contains placental remains. We have employed the test in two such cases:—

Case I was that of a patient admitted twenty-one days after labour. The temperature was 100·2° F., and the uterus was bulky although the cervical canal was closed. Abderhalden's test proved positive. The uterus was explored and a portion of placenta removed.

Case II.—A patient was admitted on August 20, who had been delivered fifteen days previously. The temperature had risen to 100° F. on the eighth day, and from that time had run an irregular course, occasionally reaching 102° F. at night. The lochia had ceased on the eighth day, and before that had been a little offensive. On admission the uterus appeared to be well involuted, but the cervical canal admitted the finger. Abderhalden's test was positive.* The uterus was explored; it contained a considerable quantity of decomposing blood-clot but no tissue which could be identified definitely as placenta.

The remaining two cases call for very little comment:—

The first was a woman, aged 21, whose menstrual history was uncertain, and who, after a fright, suddenly developed choreiform movements. Abderhalden's test was positive.* I have seen this patient again—the signs and symptoms of pregnancy are now unmistakable.

The second was a patient under the care of Dr. Hamill, at the Hospital for Diseases of the Heart. When seen, she complained, amongst other symptoms, of six weeks' amenorrhœa. Dr. Hamill suspected pregnancy, but the patient did not think this possible, and further stated that her periods had always been irregular and scanty. Abderhalden's test gave a negative result. Dr. Hamill has not examined the patient again, but she states that she has no doubt of her condition and has felt fœtal movements. It is probable that the test was applied too early in this case, and we were anxious to repeat it at a later stage of gestation, indeed the patient came to St. Bartholomew's for this purpose, but felt unwell and left before the blood was taken.

In reviewing these cases I draw the following conclusions:—

(*a*) It is established that the serum of pregnant women contains a ferment specific to placental albumen.

(*b*) This ferment can be demonstrated from the eighth week of pregnancy until ten days after delivery.

(*c*) That its presence may be demonstrated by the polarimeter or by dialysis.

(*d*) That the former method is the more reliable in that the sources of error are fewer.

(*e*) That the accuracy of the test depends upon most scrupulous care in details, and it is only in the hands of an expert that the results can be relied upon.

(*f*) That the ferment is found only when chorionic tissue is present in the body.

(*g*) It is possible that under other conditions the colour reactions and optical effects produced by the test may be simulated.

(*h*) That we have already detected most of the common sources of error, and that in the near future the test may be expected to give reliable results.

DISCUSSION.

The PRESIDENT (Dr. W. S. A. Griffith) felt sure that the whole Section fully appreciated the value of this contribution. Owing to the great difficulty in technique the value of the results depended entirely on the accuracy with which it was carried out, and in this respect the authors had our fullest confidence. The value of Professor Abderhalden's researches was not confined to the diagnosis of pregnancy but probably had a far wider application in other matters and in the early diagnosis of important diseases.

Dr. BLACKER was interested to see that the authors washed their placentæ free from blood with tap-water. He thought salt solution was more commonly employed. Schlimpert and Hendry had found it impossible at Freiburg to get the placenta free from blood with the local tap-water, and did not attain uniform success with the test until they employed salt solution. It was very interesting to find that a case of tubal pregnancy with the formation of a tubal hæmatocele had given a positive result. It was precisely in this class of case that the method would be likely to prove of clinical value, but it was not at all certain that in many such cases chorionic villi would find their way into the blood, especially if the ovum died at an early stage of the pregnancy.

Mr. DENNIS EMBLETON said it was obvious from the work done on this subject, that although Abderhalden's serum diagnosis of pregnancy was exceedingly valuable from the research point of view, as a practical clinical test it had too many possibilities of error to be either reliable or easily applied. Dealing with the dialysing method, which was the more easily applicable of the two, the following were the possible sources of error: (1) The membranes used for dialysis must permit the passage of degradation bodies and must not allow unaltered albumin to pass; further, these membranes were very easily damaged. (2) The placental antigen must be free from blood and must be rendered free from protein degradation bodies (a tedious procedure). (3) The serum to be tested must be obtained free from hæmoglobin and must be free from digestion products; in order to ensure absence of the latter the patient must abstain from food for at least four hours before the blood was taken. Dr. Thiele and Mr. Embleton had been able to demonstrate the presence of Abderhalden's proteolytic placental ferment by a complement-fixation test. This test seemed to have none of the sources of error mentioned above. The antigen used in the reaction was a preparation of placental nucleo-protein. The serum could be obtained at any time, and less was required for the reaction. The complement used was that of the guinea-pig. This test could be further used as a quantitative reaction, and so enable research to be carried on with regard to the variation in the ferments in the various toxicoses of pregnancy, and with regard to the possible lowering of the ferment activity in the onset of deciduoma malignum. Over 100 bloods had been tested by this method and so far all had shown the result expected.

Dr. ARCHIBALD LEITCH, who had experimented with the dialysation method of Abderhalden in cases of cancer as well as pregnancy, was not inclined to agree that the technique presented any special difficulties to the average careful worker. In fact it was much simpler than what was entailed in the Wassermann reaction properly performed. It was true there were many factors in the Abderhalden reaction still obscure that prevented complete reliance being placed upon it as a diagnostic method even in pregnancy. It was undoubtedly very valuable as an aid, but naturally one's scepticism was aroused when enthusiastic disciples proclaimed it to be infallible, and he was very pleased to hear that Mr. Mackenzie Wallis, who certainly was a careful investigator, had encountered false results. His own work had shown him that in practically all cases of pregnancy the reaction was positive—that is, there was evidence of a proteolytic ferment in the serum capable of acting on coagulated placenta—but, on the other hand, out of some forty cases definitely known not to be pregnant, he had false reactions in two cases of chronic appendicitis and in three, amongst thirteen, cases of malignant disease. He was not prepared to accept the absolute specificity of the protective ferment in pregnancy for he had found that in some cases it split up various coagulated carcinomatous tissues. Probably in no case was a ferment so specific that it did not degrade allied substrates. Several precautions had been laid down by Abderhalden and others which, one suspected, could only have occurred to them after false indications had been observed, and yet these false reactions were conspicuously absent from their papers. Take, for example, the statement that the placental tissue must be washed until it was perfectly colourless. A priori, why should this be necessary if the tissue were boiled sufficiently enough so that the water showed no further trace of dialysable substances? Yet it was found by Schlimpert in Freiburg that some tap-waters were incapable of rendering the placenta colourless, and this worker obtained false reactions until saline solution was used for the washing. The London water was good enough for the purpose, as he had tried both methods. Again, it was laid down that hæmoglobin-tinted serum must not be used, as false reactions would occur: first, because the hæmolysis was the result of some obscure ferment, and secondly, because dialysable stuffs would be present. The first contention would tend to throw doubt on the specificity of the protective ferment, and the second could easily be excluded. He had tested the action of hæmoglobin-tinted serum in eight cases without getting a false indication, though he would not on such slender grounds argue for its use. The other point about the removal of blood long after a meal in order to avoid the presumed presence of dialysable substances in the serum could be met by dialysation of the serum previous to testing. The theory had been put forward by Abderhalden that properly prepared placenta might contain a small quantity of dialysable products incapable of detection by weak concentrations of ninhydrin and the same might obtain in the case of any non-pregnant serum, and yet, when these two were added, the dialysate might show a sufficient amount to give the reaction. This explanation to account for false reactions was probably worthless, because in those cases where he had obtained false indications the placental tissue was boiled until the washings remained colourless to as much as 5 c.c. of ninhydrin solution, and the serums had been dialysed previously for several hours against running water, and further the tests had been multiplied. The method was still in its infancy, and there were many points yet to be worked out experimentally and many mistakes that experience would teach them to avoid, but there was no question that the genius of Abderhalden had opened up a new and fertile ground in pathology.

Dr. M. DONALDSON said he had been working at this test in the laboratory of pathological chemistry of St. Bartholomew's Hospital. He had done twenty-five successful tests. This number was, of course, not nearly sufficient to allow of any conclusions, but his impression at present was, that a test showing the absence of pregnancy was of greater value than one showing a positive result. In two of his cases the diagnosis was a question of ectopic gestation; both gave a positive reaction, but on operation one proved to be a pyosalpinx. He agreed with Mr. Wallis that the technique was extremely difficult but considered that some of the possible errors mentioned were more theoretical than real.

Mr. BOURNE said that he had carried out the serum test of pregnancy a number of times, about thirty, by means of a modified technique, which he considered to be much simpler than that described by Mr. Wallis. The essential point of the modification consisted in the abolition of the dialyser, and the removal of the serum proteins by boiling. Briefly, he incubates serum with placenta in a test-tube for twenty-four hours, and then boils to throw down serum proteins, after which he tests the filtrate by the ninhydrin reaction. The results so far were good, failures having occurred on two occasions, one being a case of eclampsia at seven months, and the other being tested by the biuret reaction. In his opinion, the technique was so simple after having eliminated the troublesome dialyser that it was quite possible to make use of the reaction as an ordinary clinical test.

Dr. WILLIAMSON, in reply, said that the only question raised of clinical interest was the value of the test in cases of ectopic gestation. He was unable to follow the reasons which led Dr. Blacker to suggest that probably placental albumens did not pass freely into the blood-stream in cases of ectopic gestation. There was definite evidence that they did, and further, Abderhalden and several others who were working at the subject had recorded cases of ectopic gestation in which the test gave a positive result. It was quite a mistake to suppose that the test had little value in these cases; it had a very high value provided the gestation had advanced sufficiently far for the ferments to have become elaborated. The time varied; sometimes a positive result could be obtained as early as four weeks, sometimes it was not obtained until after the completion of eight weeks.

Mr. MACKENZIE WALLIS, in reply, stated that he was aware of the difficulties experienced by Schlimpert and Hendry in washing their placental tissue preparation free from blood when Freiburg water was used. He had found, however, that it made no real difference whether tap-water or saline was used, as London tap-water was quite adequate for the purpose. The proposed modification of carrying out the test without the use of dialysing tubes did not commend itself to him in view of experiments performed with inactivated sera. On adding amino-acids to any serum and then inactivating the mixture by heating to 60° C. for thirty minutes, subsequent dialysis yielded a negative ninhydrin reaction. The amino-acids apparently combined with the coagulated proteins, and were thus prevented from diffusing through during the sixteen hours of the experiment. These observations pointed to a serious error in any method where dialysing tubes were dispensed with. The results further demonstrated that even the control test of inactivation of the serum was not altogether free from objections. He (the speaker) had no wish to convey the impression that the test was a difficult one to perform, the object of the paper being to point out that uniformly correct results could only be obtained provided the technique was perfect in every detail. The results of several writers who failed to maintain Abderhalden's claims had been proved to be due to non-compliance with the instructions laid down by him. The test did undoubtedly distinguish between healthy pregnant women and healthy non-pregnant women, and there was no evidence to show that Abderhalden's work was based upon insecure foundations.

Obstetrical and Gynæcological Section.

November 6, 1913.

Dr. W. S. A. Griffith, President of the Section, in the Chair.

The Relation of the Internal Secretions to the Female Characteristics and Functions in Health and Disease.

A Paper Introductory to a Discussion on the Subject.

By W. Blair Bell, M.D.

During the last quarter of a century gynæcology and obstetrics, which were previously an art, have also become a science. Throughout this period endeavours have been made more completely to understand the scientific foundations—morphology, physiology, and pathology—on which our speciality, like all other branches of medicine, must necessarily be established, and without a full knowledge of which the more obscure disorders will inevitably baffle our skill. The neglect in the past of the anatomist, the physiologist and the general pathologist to take the female genital organs within their ken has left the modern gynæcologist a field for research wherein discoveries await him at every turn.

In his valedictory address Dr. Amand Routh [22], the last President of the Obstetrical and Gynæcological Section of the Royal Society of Medicine, called attention to many difficult problems which are being assiduously investigated at the present time, and he showed clearly, I think, that the great advances of the future will be initiated in the laboratory rather than in the operation theatre. I mention this because, although I agree with him, I think there is a very great danger of clinicians relying too much on the laboratory work. Having had experience from both points of view I want emphatically to state that in many abstruse studies the final solution is often forthcoming from clinical observation. Indeed, the whole of our knowledge of certain physiological questions in connexion with the subject under discussion has been gained, as I shall indicate later, by the study of pathological phenomena. Further, it cannot too strongly be emphasized that laboratory work is carried out in order that the knowledge so gained may be applied to clinical practice, which thus sets the seal on or checks experimental work.

I look upon it, therefore, as a happy augury that the Council of this Section should have set aside an evening for the discussion of one of the most complicated problems of gynæcology and obstetrics; and I feel greatly honoured at being entrusted with the task of introducing the subject.

The discussion should be of particular value from the point of view I have just mentioned, in that it will correlate experimental results with the observations of those who in their clinical work have noted facts that may throw further light on the mysteries of the endocrinous organs—as the ductless glands are now called—which play such a large part in the morphology, physiology, and pathology of the female genitalia.

Introduction.

The first important point to be borne in mind in regard to this subject is that femininity itself is dependent on all the internal secretions. It used to be thought that a woman was a woman because of her ovaries alone. But there are many individuals with ovaries who are not women in the strict sense of the word. There are also many men, no doubt, who are more feminine than masculine. This, however, is a question about which I shall say little, for obvious reasons, although it will be impossible entirely to avoid it. It indicates a line of thought which is really the object and fundamental basis of this discussion—namely, we can no longer consider that the gonads act *alone* in their influence on the female genital functions, except in regard to the production of ova. We must, in fact, consider the ovaries as part of a system, to which most, if not all, the other endocrinous glands belong, and in which they figure with as great importance as the ovaries themselves in their relation to the reproductive functions. It must be remembered, too, that when we talk of the genital functions of the ductless or endocrinous glands, we refer not only to their influence on the integrity of the uterus—anatomically and physiologically—but also on the general metabolism, which is influenced to subserve the necessities of these special functions.

In dealing with the problems before us it will be best, I think, first to outline the more purely morphological and physiological aspects. I shall do this briefly, for I have already this year, in the Arris and Gale Lectures [7 [1]], gone somewhat fully into the details of this part of the subject. Afterwards I shall indicate what I believe to be the associated pathological conditions to be recognized, and in some cases the methods whereby they may be treated.

PART I.

Morphological and Physiological Considerations.

At the commencement it is essential that we consider how far the internal secretions are concerned in producing the feminine characteristics and ensuring the full development of the genital organs. Afterwards I shall support with experimental evidence my statement that the internal secretions of the ovary alone are not the sole factors in the preservation of the integrity of the genital functions once these have been fully established.

Production of the Female Characteristics and Functions.

What is it that makes a woman a woman? With our present knowledge it appears probable that although the potentiality to produce femininity exists in the earliest stages of segmentation of the ovum, this potentiality is directed towards the future development and correlations of the endocrinous glands which are to control the sexual evolution of the individual.[2]

It may be stated most emphatically that the ovaries alone are not responsible for the female characteristics.

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[1] These lectures may be read in conjunction with this paper, which is in part an attempt to apply the experimental findings to clinical practice.

[2] The word "developmental" may be used in connexion with two periods or stages in the development of the genital organs. The first stage is during fœtal life, when the organs are originally formed; and the second is at puberty, when full anatomical and physiological development takes place.

Dr. Russell Andrews had under his care a male pseudo-hermaphrodite who was to all appearances a prepossessing woman, and had passed as such. During an exploratory laparotomy for some obscure hæmorrhage from the vagina the absence of uterus, Fallopian tubes, upper part of the vagina and ovaries was demonstrated. There were instead testes within the abdominal cavity. No doubt all the other organs of internal secretion were of the feminine type. This is not mere conjecture, for it was first well shown by Bulloch and Sequeira [10] that the suprarenal cortex is largely responsible for the secondary sexual characteristics. Most of the evidence, however, in regard to the influence of the suprarenals has been obtained from pathological phenomena which will be discussed later.

We know less of the actual influence over the secondary characteristics of the other organs of internal secretion, but there is a large body of evidence gradually accumulating which tends to show that the pure female and the pure male are produced by all the internal secretions, probably acting in association with that of the gonads.

We must next consider the influence the endocrinous glands exert on the secondary development of the female genital organs and their functions in the individual perfectly formed in regard to the genitalia and secondary characteristics. This part of the subject is one which in its pathological aspect constantly confronts us in our clinical work.

Although the genitalia may be normal morphologically at birth (primary development), they only become functionally active at puberty (secondary development) if the whole endocrinous system is in perfect harmony and acting efficiently. Thus thyroid or pituitary insufficiency may cause the genital organs to remain infantile; and, as we shall see later, disease of these structures may cause retrogression in the genitalia even after they have functionated normally. Further, it is known that the gonads and uterus remain under-developed until the thymus atrophies at the time of puberty. At this period of life, owing to the withdrawal of the thymus secretion, as some authorities think, the genital organs begin to develop. Other investigators, however, believe that it is the development of the gonads which causes retrogression in the thymus. The probability is that both views are correct; for experimentally it is found that removal of the ovaries leads to hypertrophy of the thymus, even after atrophy has occurred in the normal course of events. Likewise removal of the thymus in male guinea-pigs is said to be followed by a rapid development of the genital glands (Paton [21]).

It may be well to interpose a few words here by way of explanation and illustration of the inner meaning of the correlations that exist between the organs of internal secretion. One organ, such as the thymus, is not normally antagonistic to another, such as the ovary, for any but specific reasons. And further, they probably do not interact on one another except indirectly through the general metabolism.

To make this clearer, let me go into the illustration just given a little more fully. It is believed that the thymus produces calcium retention in the tissues and thus assists in building up the bony skeleton. In fact, animals from which the thymus had been removed were found by Basch [3] and others to suffer from softening of the bones. On the other hand, I have shown experimentally that the ovaries are katabolic in regard to the calcium salts [7]; and this is also indicated in certain pathological conditions to be referred to presently. Now the calcium metabolism, around which for the moment I am building up my argument, is differently employed, if I may use the term, at three different periods of life. Until puberty calcium is chiefly utilized for building up the skeleton; after this for reproduction, and lastly, and pathologically, if the termination of life be pathological, for producing changes which are associated with senility—namely, the retention of lime salts in the tissues, especially in the arteries.

I will not allude to the many other important parts played by the calcium salts in the human economy at all periods of life. Nor must it be thought that the thymus and ovaries alone influence the calcium metabolism; for, as in the metabolism of other elements all the endocrinous organs are concerned, either anabolically or katabolically. And the same differences in regard to metabolic conditions are found in many—perhaps all—directions at the three essential periods of life which I have just described. As a natural consequence we find that the structure of the organs of internal secretion differs not only at different periods of life, but normally in different circumstances, such as those concerned with the intermittent reproductive functions of women. Further work on these normal periodic variations is urgently needed.

Having indicated generally the way in which the internal secretions influence the production of the fully developed genital organs with normal functions, I must now pass on briefly to consider the relative part played by each member of the endocrinous system in the preservation of the integrity of these organs and their functions.

MAINTENANCE OF THE FEMALE CHARACTERISTICS AND FUNCTIONS.

It follows logically that the factors which give rise to femininity and the normal development of genital activity should also be chiefly concerned in the maintenance of the female characteristics and functions. I shall adduce further evidence to show that this is so when we consider the pathological aspect of the subject under discussion. Here the normal processes at work may be described.

That the ovary alone is not solely responsible for the changes which occur, or for the integrity of the genitalia, is shown by many facts, both experimental and clinical. It is well known, however, that the removal of the ovaries in young animals tends to produce sometimes adiposity and almost invariably overgrowth of the skeleton; the animal is never stunted, nor do masculine characteristics develop. The uterus, however, remains infantile and does not undergo secondary development. So, also, it is certain that if the female genital glands be removed during adult life the uterus retrogresses and becomes atrophied. Some years ago Hick and I [8] showed that the primary change is in the musculature, and not in the endometrium. This change is the obvious evidence of the ovarian function in regard to the uterus. Atrophy of the uterus, can, however, be prevented for a time if an ovarian graft—especially an autogenous one—be made when oöphorectomy is performed. It is found experimentally that the follicles in grafts always degenerate, but that the interstitial cells remain unchanged for many months. The success of grafts depends on the technique employed. Thin grafts buried in a vascular site do much better than thick grafts in avascular areas. When finally the graft disappears the uterus atrophies. It is obvious, therefore, that the integrity of the uterus depends, so far as the ovary is concerned, on the interstitial cells. But Crowe, Cushing and Homans [11], Aschner [2], Biedl [9] and others have shown that the same degree of uterine atrophy—and also, it is said, ovarian atrophy—may supervene after partial removal of the pituitary body. Which portion of the pituitary is supposed to be concerned is not clear from the contradictory statements given. It is possible that the divergent opinions result from the belief that the pituitary body consists of two separate organs with different functions. I believe, however, that the pituitary body is *one organ*. In spite of the histological differences seen in the various parts we must remember that all the epithelial elements are derived from the same source—Rathke's pouch.

Further, I have shown that removal of the thyroid alone produces an intense degree of atrophy in the uterus. The ovaries, however, do not retrogress; on the contrary, there appears to be increased activity especially in the follicles [7]. In pregnancy also we know that the ovaries, the thyroid, the pituitary and the suprarenals are all concerned in the changes that take place, locally and generally. The corpus luteum in the ovary appears to assist in the implantation of the ovum, especially in rodents. This effect apparently is less pronounced in the human subject. The thyroid is especially active in early pregnancy, and the suprarenals and pituitary in the later stages. The changes in the pituitary are shown by very remarkable modifications in the staining reactions of the cells of the anterior lobe. These structural alterations are doubtless essential to the changes in the maternal metabolism, but it is unnecessary here to discuss the chemical details.

In addition to the facts mentioned concerning the local effects of the removal of the ovaries, pituitary and thyroid on the genital organs and their functions, we have very definite and precise information as to the general effects produced. And since the removal of the ovaries is an experiment some gynæcologists perform on the human subject with regularity and without a qualm—indeed they defend it by saying when they perform oöphorectomy the bad results are not worth considering—I am sure we should give this aspect of the subject special consideration, since we are not all of the same mind as to the needless removal of the genital glands.

In the first place, I would call attention to the well-known fact that women as well as animals vary very considerably in the reactions that occur after oöphorectomy. Age, individual variations in ovarian activity and in the correlations with other endocrinous glands, habits of life, health, and so on, all play an important part in the result.

We might, also, include psychical effects, because they are related to the functions of the internal secretory system as a whole; but these effects are difficult to estimate in animals, so I shall not discuss them until we come to the consideration of the pathological disorders of the internal secretions in women. Since, then, there are these individual variations it is somewhat difficult to create a quantitative standard, and this is, I think, the reason of so many divergent opinions in regard to the value of the ovaries. We can, however, recognize the qualitative changes with no small degree of precision.

In animals oöphorectomy produces the following alterations in the general metabolism:[1] There is a marked retention of calcium, which is, of course, a phenomenon normally associated with senility. The phosphorus excretion is much increased, as is the nitrogen. These observations I shall refer to again in discussing ovarian insufficiency in the human subject.

When we come to examine the other endocrinous glands after oöphorectomy in animals we find somewhat different changes according to the order to which the animal employed for experimentation belongs. I have elsewhere alluded to the normal morphological differences found in the organs of internal secretion in different animals [7]. The cat is the most convenient of the commoner animals used in laboratories, in that its endocrinous glands more nearly resemble the human than do those of the rabbit and other rodents. In this animal we find marked changes in the anterior portion of the pituitary and in the thyroid after oöphorectomy. In the thyroid there is a great increase in the colloid collections. In the anterior lobe of the pituitary there is a marked eosinophilia which I have discussed elsewhere and have described as representing an increase in secretory activity [7].

We must not consider, however, that our experimental results are final in regard to the human subject until they have been verified by post-mortem evidence in women, or by the evidence of disease. Rapid progress to this end would be assured if pathologists would make a routine practice of removing all the organs of internal secretion during post-mortem examinations, and of examining histologically the material obtained. Meanwhile laboratory experiments have this effect at least; they give us indications for clinical observation which so often leads to a complete vindication of the laboratory results, and so to settled knowledge.

In regard to the endocrinous organs, then, we have at least four demonstrated factors concerned in the integrity of the genital organs and the activity of their functions. I hope in the near future to complete experiments to learn how far the actions of the internal secretions are independent, and how far they are correlated or collective. At present my experiments seem to point to a correlated action in so far as the ovary is principally concerned, and an action in regard to the thyroid and pituitary body which is partly independent, partly correlated. The importance of these assumptions, if true, is obvious; and, though it is unwise, if not unscientific, to anticipate experimental findings, I may go so far as to say that the way seems clearer to the solution of the problem which has so long troubled us: I mean the question of a substitution product in cases of ovarian insufficiency. It seems certain that we shall find that ovarian extract alone is of little value in the majority of cases—in spite of a few favourable reports—because after ovarian atrophy or removal the other endocrinous glands are affected, as we have found experimentally, in a way which is different from that which occurs after the removal of one of the other glands; so that the substitution of ovarian extract alone is neither sufficient to combat all the metabolic disturbances nor to prevent the changes in the uterus.[1] If, however, we make use of our knowledge of the correlated changes in the other glands I believe before long we shall find a combined extract that will give us some measure of success. But even so, the range of usefulness will probably be limited by the fact that we employ animal extracts. The difference between the ovary of a herbivorous animal and the human ovary is very striking. The interstitial cells in the former are very numerous and active, in the latter they are very few. In consequence, as I believe, the thyroid in herbivorous animals is less important to their economy, and can therefore be removed without causing marked general disturbances, as many investigators and I myself have shown. But, it will be argued, the extract of the thyroid of the sheep is an efficient one for the human subject. This is quite true; but it does not alter the fact that the relations of the thyroid to the other endocrinous organs are different in sheep and the human subject. From this it follows that the best results for any given extract or combination of extracts will be obtained when they are used in an autogenous manner. This, however, can never be done in the case of the human female; nevertheless, we may be able to secure modified results with animal extracts.

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[1] In his recent work on the organs of internal secretion, under the title of "The Regulators of Metabolism," Paton calls attention to the fact that only observations conducted over a length of time can have any value, and assumes that none have been made. But, as is evident in various parts of his book, he has not made a first-hand study of the literature, for my experiments, of which he makes no mention, were conducted over far longer periods than he suggests as being necessary.

I have mentioned this matter because I thought something might be said about it, and I would like to give all the information in my power, although I wish it to be quite definitely understood that my own experimental work in regard to it is at present in an initial stage.

I have in the foregoing remarks attempted to indicate the outline which encloses the vast array of physiological facts now in our possession concerning the relations of the internal secretions to the normal characteristics and functions of the female. Some of these facts can be applied to practice immediately; the rest will in the future form nuclei for further advances. The general conclusions to be drawn are:—

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[1] An efficient preparation should, strictly speaking, prevent uterine atrophy and should maintain the function of menstruation in the young female deprived of both gonads.

(1) The development and integrity of the genital organs and their functions are dependent on all the internal secretions, individually and collectively.

(2) The removal of any one organ of internal secretion produces changes in the others, and by this means we gain some insight into the nature of the correlations that exist.

(3) The general metabolism is altered by extirpation of any of these organs. This alteration in the general metabolism affects the genital metabolism.

From our physiological work we carry on to the study of the pathology of gynæcological and obstetrical disorders information which may be applied in the following directions:—

(1) Our knowledge of the influence of the internal secretions on the sex characteristics and on the development of the genitalia helps us to understand the pathology of hitherto obscure conditions connected with sex characteristics and the development of the reproductive organs. So, also, can we trace the influence of the internal secretions on the psychology of our patients, for in women femininity is associated with psychical qualities which need not be defined here. These qualities are due to the combined action on the brain cells of the metabolic conditions produced by the feminine organs of internal secretion; and the normal psychical condition is frequently disturbed by pathological conditions of the endocrinous glands.

(2) Since we know something of the influence of the internal secretions on normal menstruation, we can note the abnormal effects produced in regard to the menstrual function, and conversely we can observe the effects produced on the organs of internal secretion by local derangements of the genital organs.

(3) Knowing, also, the part played by the internal secretions in the metabolism of pregnancy we can, in the same way, observe the effects of deviations from the normal.

PART II.

Pathological and Therapeutical Considerations.

In considering the relation of pathological conditions of the internal secretions to the genital organs and their functions I shall follow as far as possible the arrangement adopted in describing the physiological processes; that is to say, I shall first discuss the derangements in the normal development of the genital organs and their functions, and subsequently the derangements associated with the maintenance of these functions.

Derangements in the Development of the Genital Organs and their Functions.

(1) *Imperfect and Irregular Primary Development of the Genitalia.*

Primary maldevelopment of the genital organs may result in the following conditions:—

(*a*) Under-development of the ovaries and uterus, which may otherwise be perfectly formed.

(*b*) Under-development or imperfect development of the uterus with normal development of the ovaries.

The first of these conditions is usually associated with what is known as asexual ateleiosis, the cause of which is due, no doubt, to some general disorder in the endocrinous system. At the present time we have no definite knowledge on this matter, but it is hardly possible that genital under-development with ateleiosis can be due to primary ovarian insufficiency alone in view of our experimental evidence.

The second class of case in which the ovaries are normal while the rest of the genitalia are imperfectly developed, or even assume male characteristics, is interesting, if only because some of the conditions met with are liable to be confused with those in the first class.

It is probable, however, that in the presence of normal ovaries imperfect development of the uterus and incomplete union of the Müllerian ducts, with the various associated abnormalities which may be found, are due to some local structural irregularities which are, as yet, not fully understood [4]. But where the genitalia, apart from the ovaries, assume the male type, and, in fact, give rise to the condition known as hermaphroditismus femininus, we have some definite evidence of the influence of an internal secretion, not produced by the genital glands, on this condition.

Among eighty-eight cases of female pseudo-hermaphrodites recorded by Neugebauer [18], Glynn [14] found that suprarenal hyperplasia was observed in at least 15 per cent., whereas in only 0·7 per cent. were there suprarenal lesions in the male pseudo-hermaphrodites. These figures make no allowance for the fact that many of the cases were certainly not examined post mortem. I shall have more to say later about the relation of the suprarenals to the maintenance of the secondary sex characteristics.

(2) *Irregular Secondary Development of the Female Genitalia and Characteristics.*

By secondary development of the genital organs and female characteristics I refer to the changes which normally occur at puberty. The onset of the functional activity of the ovaries and the associated secondary sexual characteristics which become evident at this time change the girl into a woman.[1] Since the advent of puberty itself is dependent on the general metabolism, which is influenced by the internal secretions, we can easily understand how disorders of the endocrinous system influence the phenomena associated with this period of life.

(*a*) *Precocious Puberty.*—This is an extremely interesting phenomenon, wholly dependent, as far as we know, on disturbances in one or other of the endocrinous glands. It is probable, of course, that a lesion in one organ affects the others, but with this we are not at the moment concerned. In the first place, it is important to remember that the results produced by tumours and hyperplasias in the organs of internal secretion other than the gonads are not the same in the different sexes. So that while suprarenal hypernephromata in *male* children are practically always associated with precocity of the sexual organs and secondary characteristics, in female children with suprarenal hypernephromata the sexual organs are not precociously developed, for the tendency is rather to produce in them the characteristics of the male—a deep voice, enlargement of the clitoris, hirsuties, and so on. It is true that cases of precocity in females with these suprarenal lesions have been described, but it appears to me that pubic hirsuties with over-development of the clitoris—a masculine transformation—may have been wrongly interpreted into excessive development of the female external genitalia, as was certainly done in Orth's case [20]. Bulloch and Sequeira [10], however, report the case of a girl, aged 11, whom they describe as precocious, and in whom menstruation existed. But I do not think the evidence submitted is sufficient to justify the statement as to *female* precocity, especially in view of the facts that she only commenced to menstruate at the age of 10, and that subsequently she had much hair on the lips and chin.

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[1] It has already been mentioned that the uterus may be malformed owing to local pelvic conditions, with full development of the ovaries. In such circumstances puberty occurs although the uterus may be functionless.

It is probable, therefore, that the view I have stated is the correct one; indeed, I fail to understand how it can be otherwise when we consider the evidence at our disposal as to the masculine metamorphosis that occurs with these same lesions in the suprarenals in young adult women. Most of the cases of suprarenal hypernephromata observed in children have occurred in girls. In the case of a boy, who died at the age of 5, recorded by Linser [16], there was precocious development of the genital organs with sexual activity. Similarly, it is interesting to note that tumours of the pineal in boys always lead to sexual precocity, but do not do so in girls.

It is difficult to interpret this curious sex selection in regard to these lesions in different organs, but certainly it appears at first sight as if both the pineal and suprarenal cortex influenced the production of male characteristics. We must remember, however, that we have no reliable evidence as to whether tumours of the pineal give rise to excessive or decreased secretion, but the above suggestion does not necessarily depend on an increased secretion from the pineal in the circumstances mentioned.

Although the foregoing facts concerning the suprarenal cortex and the pineal are negative in regard to sexual precocity in girls, I have dwelt on them as it is necessary to clear the ground in this matter, for most clinicians seem to be under a misapprehension, since they conclude that corresponding lesions produce sexual precocity in either sex. This, as I have endeavoured to show, is not so except in regard to lesions in the gonads. Indeed, to come to the point, it appears probable that nothing in regard to lesions in the endocrinous glands except certain tumours and hyperplasia in the ovaries will give rise to true sexual precocity in the female. Many such cases are on record. A typical example is that related by Lucas [17]: A girl, aged 7, had markedly precocious development with menstruation. A solid ovarian tumour of doubtful nature was removed, and the signs of puberty thereupon gradually disappeared. It follows, therefore, that unlike sexual precocity in boys, this phenomenon in girls is *only* associated with tumours or hyperplasia of the gonads.

(*b*) *Delayed Puberty.*—Delayed puberty may be due to a variety of causes, such as bad feeding, unsuitable occupation, chlorosis, and so on, in which it is difficult to trace a primary cause in the internal secretions; at any rate, one need take no account of them in the treatment of such cases. But there is a large number of instances in which the organs of internal secretion are primarily at fault. As already stated, the internal secretions of the ovary mainly produce their effects in correlation with other internal secretions; and the full development of the genitalia, therefore, is dependent on the general metabolic conditions prevailing under the influence of all the endocrinous glands. So that, strictly speaking, one cannot consider under-development of the ovary as a primary factor in delayed puberty, although, undoubtedly, it may be found to be under-developed as a correlated condition. Practically, it appears that the thyroid and pituitary, in association with the ovaries, are the factors most concerned in the final development of the female genital organs. It will easily be understood how important a matter it is that all cases of delayed puberty—both in major degree where the patient remains child-like altogether, and in the minor degree where she is well developed in every particular except in regard to the genital functions—should be carefully taken in hand at the earliest possible moment. These patients are frequently obese, consequently this condition has been considered to be a primary cause of delayed puberty. This is not so; both conditions are dependent on the same cause.

Many cases can be treated successfully with thyroid extract, and some with pituitary extract in large doses. Extract of the whole gland should be prescribed.

There appears to be little chance of effecting full development of the uterus after the age of 20 years. This, at first sight, appears to be a somewhat curious fact, for one might think that if a uterus can be, and normally is, roused into activity after fifteen years of primary inactivity, ten more years of quiescence would make no difference. It must be remembered, however, that the body metabolism alters rapidly after the eighteenth year of life, when the development of the skeleton is practically completed; so that, unless genital activity be aroused during the period of change, it is impossible sufficiently to control the metabolism, which has become rearranged, in order to produce the effect desired.

DERANGEMENTS OF THE FULLY ESTABLISHED FEMALE CHARACTERISTICS AND FUNCTIONS.

Derangements of the Sexual Characteristics.

The secretions of the endocrinous glands which have produced the normal female continue subsequently to act in the same way—passively, no doubt—and it is only some extensive alteration in the structure and function of certain units of the internal secretory system which can bring about an alteration in the female sexual characteristics once they have been determined, and the genital organs have become functionally active. So far as we know, the withdrawal of any one secretion will produce no change. There must be some overgrowth in those parts of the endocrinous system, apart from the genital glands, which normally produce masculinity—a potentiality which appears to be concentrated in the suprarenal cortex, the pituitary body, and probably in the pineal. Apert [1] has asserted that masculine characteristics may be produced in women by simple ovarian tumours. But, as Glynn [14] points out, there is no evidence in the cases reported that the suprarenals were examined, or, I might add, the pituitaries and pineals.

It will not be waste of time to digress for a moment in order to consider the essential differences that occur in the metabolism in response to stimulation from the masculinity-producing secretions. Probably the most important and obvious changes are associated with the metabolism of the lime salts. The male skeleton is far heavier and stronger than the female, so that in men one of the most essential metabolic conditions is a considerable calcium retention during growth; besides, there is normally in men a stable and invariable metabolism of calcium during the reproductive period. With women there is less calcium retention during growth, and throughout her reproductive life rapid alterations in the metabolism of lime salts occur during menstruation, pregnancy, and lactation. So that it is not surprising to find that those parts of the endocrinous system which are largely concerned in the storage of calcium and the building up of the skeleton should also, when abnormally active in the female, produce, or lead to the production of, other masculine characteristics such as growth of hair on the face and alterations in the formation of the larynx and breasts. As we have already seen, overgrowth or tumour formation of the suprarenal cortex in girls before puberty leads to the production of male characteristics. These growths have generally been found to be malignant, so that no ultimate history has, so far as I know, ever been obtained in regard to the cases recorded.

In adult women, before the menopause, the changes towards masculinity associated with suprarenal hyperplasia and neoplasia may be most marked. Menstruation ceases, the breasts shrink, hair grows on the face, the voice deepens; and last, and not least, profound psychical changes have been known to occur, a previously gentle woman becoming rough and aggressive. A number of such cases has recently been collected by Glynn [14A].

With acromegaly, too, I have seen a somewhat similar change. In one case menstruation ceased, the skin became coarse, the voice deep, the breasts shrunken, and last, and most interesting of all, the clitoris hypertrophied until it resembled a small penis. We know that, in the male, acromegaly (hyperpituitarism) at first gives rise to increased sexuality, so that the reverse obtains in the female, in whom there is a tendency towards masculinity. In the case of the internal secretions of the pituitary, therefore, we see evidence of a difference of sex stimulation in the male and the female, just as we saw it in connexion with the suprarenals and pineal.[1]

These, then, are the main facts in connexion with the maintenance and alteration of sex characteristics in the adult female.

Derangements of the Genital Functions.

In considering derangements of the fully established functions I shall take in order each of the chief organs of internal secretion and endeavour to show how they are individually related to the various disorders met with. In some cases we have to take into account certain correlations; especially is this so where the ovary is concerned.

I think it will make this complex subject clearer if I treat it in this manner instead of dealing with the pathological conditions themselves, although the latter undoubtedly is the more scientific way. Some day, when clinical observation has been thoroughly carried out and conditions, such as we are discussing here, become, as they will, matters of daily consideration, we shall be able intelligibly to discuss the pathological phenomena related to the internal secretions as definite disorders.

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[1] The thymus *appears* to take no part in the regulation of sex characteristics in spite of its supposed influence over the formation of the skeleton. Further investigations may, however, prove that it is so concerned.

Primary disorders of the endocrinous organs may be considered as giving rise to insufficiency or excess of the normal secretions.

Ovarian Insufficiency.

Ovarian insufficiency occurring during the active sexual period is rare as a primary disorder, except when produced by operative interference. As we have already seen, when the ovaries are removed experimentally definite changes occur in the general metabolism, in the uterus and in the structure of the other organs of internal secretion; and these changes appear to be more prominent in the higher than in the lower mammals.

From observations made on the human subject there is no doubt that a similar train of events follows complete oöphorectomy. In addition, however, there are frequently to be noticed psychical phenomena which are doubtless dependent on the general disturbance of the metabolism; but marked individual variations exist in the symptoms produced just as normally there are considerable variations in the femininity and sexuality of different women. Unfortunately, those who have asserted that oöphorectomy is of small moment to the patient have failed to make good their scientific position in the matter by the exercise of a discretion that appears obvious in view of what has been said regarding individual variability. If one were to gauge, and in many cases it would not be difficult, the degrees of femininity and ovarian activity in the patient, it might be possible to assert that in those cases in which these were obviously in abeyance little disturbance of the metabolism would result; and consequently it might be justifiable in such cases to remove the ovaries with a fibromyomatous uterus or with infected tubes. But unless such a scientific distinction, which undoubtedly does exist and accounts for the individual variations after oöphorectomy, be made, it does not seem right blindly and systematically to remove the genital glands.

It will be interesting to hear the other side of the question, which at the present time is receiving much support. I have not elsewhere met with the obvious explanation I have given of individual variability in this respect. But if it be true it should influence us largely in our operative procedures. In many cases, of course, there is no choice; that is to say, the operator must choose the lesser evil in malignant diseases and in cases of severe ovarian infections. It will be worth while, therefore, to consider the bad effects which may follow oöphorectomy, and how they may be met. I shall be as brief as possible, for most of what can be said on the subject is general knowledge. And since the artificial menopause is closely comparable with the natural we may advantageously consider them together, in order to avoid repetition.

It is more or less generally supposed that the natural menopause occurs in women as the result of an ovarian insufficiency. Undoubtedly there is ovarian insufficiency sooner or later, but it has always seemed to me that the symptoms produced depend for their severity on the correlations that exist between all the internal secretions, on the uterine changes which prevent the monthly excretions, and, lastly, on individual variability as to sexuality and to the stability of and capacity for readjustment in the endocrinous system. That the phenomena associated with the natural menopause partly depend on ovarian insufficiency is proved by the onset of similar manifestations in most women after oöphorectomy. That they are related to the coincidental uterine atrophy is proved by the fact that women may suffer from these same symptoms after removal of the uterus alone. Also, I have seen monthly molimina which reminded one strongly of some of the symptoms of the menopause in women in whom there was congenital absence of the uterus or malformation sufficient to prevent menstruation, together with functional ovaries. Finally, the natural menopause varies in its severity in different women, just as does the artificial; but probably chiefly according to the extent of femininity, which is accentuated by ovarian activity.

The main types of menopausal phenomena to be observed clinically may be classified as follows:—

(1) Psychical.
(2) Vasomotor.
(3) General metabolic.
(4) Gross changes in the endocrinous glands.

Thus we may observe:—

(1) Mental irritability or instability.

(2) Flushing with sweating, cardiac distress and intestinal movements.

(3) The deposition of fat and the retention of calcium salts in the tissues.

(4) Excessive changes in the endocrinous glands, especially the thyroid and pituitary body. One of my patients died of exophthalmic goitre one year after the removal of both ovaries for malignant disease. Myxœdema, which recent views associate with previous excess

of secretory activity in the thyroid, also usually occurs after the menopause. The changes in the pituitary are less noticeable, but the deposition of fat may be the result of what is known as carbohydrate tolerance, due to hypopituitarism. This condition is always seen in the disease known as dystrophia adiposo-genitalis.

It must be remembered, of course, that the phenomena mentioned above are classified clinically. They are all primarily due to disturbances in the endocrinous organs.

It is impossible here to discuss fully and scientifically each of these groups of phenomena, for we do not know the exact part played by the various organs of internal secretion. For instance, we are at present unaware of the extent to which calcium retention produced by ovarian insufficiency may be overcome by the secretion of the thyroid, or how far the excessive excretion of phosphorus, which occurs after castration, may be prevented by other endocrinous organs. Obviously, however, the patient must suffer if compensation or readjustment is not successfully brought about.

The information required before we can speak with certain knowledge about the changes at the menopause is considerable. Work must be done on the normal age changes in the endocrinous glands, and especially the changes that occur at the menopause ; and the metabolism before, during, and after the menopause must be worked out in a number of cases and compared. But however little we know about the metabolism of, and the structural changes in, the glands of internal secretion at the natural menopause, we recognize the fact that the more gradual the onset and completion the less the general disturbance. Many women, of course, have prolonged and distressing menopauses, but in some, at least, I am inclined to think that the menopausal retrogression is spasmodic rather than continuous. The cases of the natural menopause in which the disturbance is great are undoubtedly those which occur suddenly, and for this reason the artificial menopause is liable to be more serious than the natural.

There seems, too, to be some relation between the severity of symptoms and the age of the patient. In this respect, I believe, the natural often differs from the artificial menopause. When it occurs in young women (35 to 40 years of age) naturally, or pathologically as in superinvolution of the uterus, the symptoms are usually slight. Possibly this is because the genital functions in such women have never been predominant. When the natural menopause occurs in elderly women (50 to 55) the symptoms are often severe. On the contrary, the artificial menopause usually produces far worse effects in young women than in those over 45 years of age, the degrees of femininity being equal.

To complete the picture of ovarian insufficiency it is necessary that we should turn for a moment to the question of the ovarian secretions in pregnancy. It was first shown by Fränkel [13] that destruction of the corpus luteum in the early stages of pregnancy inevitably caused abortion in animals. Hick and I [8] and others have confirmed the importance of the ovarian secretions in the implantation of the ovum in rabbits. But this does not hold good to the same extent in the human subject, for both ovaries have been removed as early as the sixth week of pregnancy without producing abortion. In such cases the question of the entire removal of the ovary is easily settled by the subsequent history of the patient. At the same time it is almost certain that the initial implantation of the ovum could not occur in the absence of the secretion of the corpus luteum. And, indeed, such insufficiency may be the cause of many early abortions.

It has been suggested that, during pregnancy, ovulation does not occur, and that the internal secretions of the ovary, apart from that of the corpus luteum, are in abeyance. I do not think there is any real evidence in support of these statements. Nevertheless, if such were the case, it might indicate that ovarian insufficiency during pregnancy threw a considerable strain on the other organs of internal secretions such as the thyroid and anterior lobe of the pituitary, and, in fact, might be the original cause of some hyperplasias in these structures.

In an endeavour to compress into a short space a general description of the menopause, and to compare the natural with the artificial, I have not, I fear, dealt very satisfactorily with the subject; but this is partly because much easily to be obtained information is still needed. For the same reason the treatment of ovarian insufficiency—especially that which is artificially produced—is still most unsatisfactory.

The question of ovarian transplantation naturally first crosses our minds. Experimental and operative evidence goes to show that autogenous grafts alone are of service. In rabbits, grafts from one animal to another have been shown to be effective, but only for a short time. Professor Tuffier, of Paris, has found that, in the human subject, only autogenous grafts are of any use at all. Ovarian transplantation, therefore, can only be employed in *mitigation* of the artificial menopause. That is to say, autogenous ovarian grafts may be of value in women under 40 years of age in whom both ovaries have been removed; but they can be employed only in those cases in which the lesion is not malignant. Thus there is a very restricted field for this method of treatment, especially when we remember how rarely it is necessary entirely to sacrifice the whole of both ovaries in other pathological conditions. In the circumstances indicated, however, I believe it to be a most valuable and even imperative procedure. When a graft is made it is better, I think, to use a thin, flat, or wedge-shaped piece of ovary without the cortex, in order that the extensive raw surfaces may quickly obtain attachment and an efficient blood supply be established, and that by the removal of the cortex cyst formation in the follicles, which is otherwise inevitable, may be avoided. Recently I saw Professor Tuffier, of Paris, implant an ovary. He simply buried the *whole* ovary in the anterior abdominal wall. This appears to me a very bad technique, for the reasons indicated above. In any case, as far as we know, the menopause is only postponed and thereby mitigated by ovarian implantation.

I have already indicated the difficulties associated with ovarian medication, and therefore need not further discuss them, beyond saying that there is at present no scientific foundation for the employment of extracts made from parts of the ovary which do not contain interstitial cells, except, perhaps, in the attempt to treat repeated abortion by extract of the corpus luteum; and that I believe that the treatment of menopausal disturbances lies in the suitable use of the extracts of endocrinous glands other than the ovary, alone or in conjunction with ovarian extract.

Excessive Ovarian Secretion.

The clinical effects produced by excessive ovarian secretion may be discussed under two headings:—

(1) Effects on the sexual functions, characteristics and psychology.

(2) Effects on the general metabolism.

It must not be forgotten that the effects mentioned in the first group are chiefly dependent on alterations in the general metabolism.

(1) An excessive ovarian secretion leads to an increase in sexual activity both locally and generally. The local effects may be seen in an increased and prolonged menstruation. This condition occurs chiefly in girls about and just after puberty who indulge in masturbation or are sexually insane, in unmarried women over 30 years of age, and in women whose married life is a failure from a sexual point of view. The patients are usually extremely feminine in appearance and character. I have previously alluded to this subject elsewhere [5], [6]

so I shall not further discuss it beyond calling attention to the fact that rabbits when kept away from the buck during the breeding season come on heat every few days; and this occurs with most female animals. Fortunately such cases are comparatively rare, but we meet with them from time to time, and may find considerable difficulty in treating them effectually. When the menorrhagia is serious and the psychical condition of the patient excessively irritable, then, if we can make an absolute diagnosis, which of course can only be done in some cases by knowing the circumstances of the patient, I believe we are as much justified in reducing the bulk of her excessively secreting glands —the ovaries—as is the general surgeon in operating for hyperthyroidism. As a rule the removal of one ovary is not sufficient, for the other may subsequently hypertrophy. At least one ovary and a wedge-shaped portion from the centre of the other should be removed.

Before long it is probable that we shall find that injections of suprarenal and pituitary extract may be employed to control the effects of excessive ovarian secretion, and in these circumstances operation will not be called for.

(2) An excessive ovarian secretion affects the metabolism in the opposite way to oöphorectomy, and one of the most important metabolic disturbances is the abnormally large excretion of calcium salts. In the non-pregnant woman this is a matter of no importance so far as the skeleton is concerned, but it possibly accounts for some of the nervous and muscular irritability, which are constant features of these cases. In pregnancy and lactation, however, there is a large demand for calcium over and above the amount necessary for the normal maternal metabolism, and, as a result, softening of the bones may occur. This condition is known as osteomalacia. Such cases are not common in some localities, and personally, I have not seen a case for many years. This disease used to be treated by removal of the ovaries, and many patients were cured. A few years ago Bossi, of Genoa, suggested the injection of suprarenal extract as an alternative to oöphorectomy. Apparently many cures have been effected by this treatment, and also by the injection of pituitary extract. So that it may be argued that there is insufficiency in these organs, as well as an excess of ovarian secretion; and this, indeed, is quite possible. Be this as it may, substitution of other extracts is a great advance on removal of the ovaries in the treatment of osteomalacia; and the success thus obtained indicates the line of attack that will probably be followed in the future in regard to all those diseases of the endocrinous glands in which there

is an excessive secretion. That is to say, metabolically antagonistic extracts will take the place of removal of portions of the diseased organs.

By way of further illustration I may here mention that, as I suggested some time ago, the injection of pituitary extract is an excellent method of treatment in hyperthyroidism. Suprarenal and pituitary extracts counter-balance the action of the ovaries and thyroid and lead to calcium retention, which, as we have already seen, is a normal function of the suprarenals and pituitary. It is probable that both portions of each of these structures are concerned in the result.

Thyroid Insufficiency.

Thyroid insufficiency always causes a decrease in or the complete cessation of the function of menstruation, according to the degree of insufficiency. I have already alluded to the complete atrophy of the uterus which follows thyroidectomy in animals; and it will be remembered that I pointed out that in my experiments the ovaries were not found to undergo atrophy, but rather to show increased activity. Apparently in the human subject atrophy of the uterus is never complete with pathological insufficiency of the thyroid, not even with myxœdema; for I have known a patient, who had had this condition for some years, not only to menstruate, but to conceive after the administration of thyroid extract.

It is, however, the disturbances arising from minor degrees of thyroid insufficiency which chiefly come under our notice as gynæcologists. Delayed menstruation has already been discussed. Secondary amenorrhœa and scanty menstruation, the latter often associated with dysmenorrhœa, are very frequently seen with thyroid insufficiency. The patients are obese, lack energy, and have deficient sexuality. There is another menstrual disturbance—namely, mastodynia—which sometimes occurs regularly each month before the onset of menstruation, in which I have found thyroid extract of great service; and in consequence of this I believe that the condition may be indirectly connected with thyroid insufficiency. If thyroid extract be given from about the twenty-fourth day of the cycle till menstruation is established this function may come on earlier than usual, with relief of the pain in the breasts. There is a natural aversion from prescribing thyroid indiscriminately, but in these minor degrees of insufficiency thyroid extract is the one preparation which will cure the patient. I have seen quite remarkable results in a number of cases. I always order the preparation—usually 3 gr. of the dried gland—to be taken only on going to bed at night. If given in this way and not during the day the patient never suffers from ill-effects.

With regard to pregnancy it is well known that normally the thyroid gland enlarges in the early stages, but I need not here go into the causes of this. It shows that increased thyroid activity, which, I believe, takes the form of a storage of colloid, is required. A marked degree of insufficiency, such as is seen in myxœdema, almost invariably leads to sterility. Cases have been recorded in which pregnancy has occurred in minor or variable states of this disease; and in such circumstances a notable improvement may be produced in the general condition, the thyroid becoming more or less active.

There is one more point in regard to thyroid insufficiency and pregnancy which requires some comment. Nicholson [19] promulgated the view, which has been taken up by many others, that eclampsia was due to thyroid insufficiency in pregnancy. I conducted a series of experiments—reported elsewhere [7]—to find out how far this was true; and I came to the conclusion that neither metabolically nor actually was there any real evidence in support of Nicholson's view. Indeed, it appeared to me that the animals in the later stages of pregnancy were considerably less affected than those which were not pregnant. I have accounted for this curious fact by assuming that in the later stages of the development of the fœtal thyroid its secretion may be conveyed to the mother. The thyroid, of course, has a most important part to play during pregnancy, but I do not think it has anything to do primarily with the causation of eclampsia.

Excess of Thyroid Secretion.

It is a common experience to meet with an excess of thyroid secretion in connexion with pelvic lesions, and we must be careful to distinguish between those cases which are the result of genital affections and those which are the cause of them. It is certain that after the menopause the thyroid normally undergoes some retrogression, after, perhaps, a period of minor hyperthyroidism; and it is probable that removal of the ovaries leads, eventually at all events, to the same condition in the majority of cases. But, as I have mentioned, acute exophthalmic goitre may intervene. Experimentally it is seen that a considerable increase in the colloid formation follows oöphorectomy, but it is probable that this is a different condition from Graves's disease.

At the same time we really know far too little about exophthalmic goitre, especially in its relation to simple goitre and to myxœdema, with which it not infrequently alternates, to speak definitely on this question. Excessive thyroid secretion may act on the genital functions in two ways. Firstly, it may stimulate them to unusual activity, or secondly, the general metabolism may be so upset that the genital functions cease. I am quite certain that there is a condition of hyperthyroidism which produces excessive menstruation, and which is totally unassociated with any of the symptoms of exophthalmic goitre. This condition is usually seen in girls about puberty, usually just before and during menstruation. It may be that the excessive activity is due to the incomplete functional development of the ovaries; but, whatever the cause, there is not infrequently menorrhagia. I have, however, seen this same enlargement of the thyroid with amenorrhœa. This paradoxical phenomenon is easily explained on the supposition of ovarian insufficiency, and an inability of the thyroid in some cases, in spite of its enlargement, to meet the deficiency. When there is menorrhagia I have found that it can always be controlled by calcium lactate.

In true exophthalmic goitre it is usually stated that amenorrhœa co-exists. I have not been able to satisfy myself that this is so until the metabolism has been seriously disordered. I believe that usually in the early stages there is menorrhagia. Should a large body of the evidence eventually disprove my belief it will be a positive argument of great value that in Graves's disease the secretion is perverted even if there be also an excess of the normal. But in this matter, also, we must remain in the dark until we have some further knowledge regarding the pathology of exophthalmic goitre.

The relation of excessive thyroid secretion to pregnancy is very interesting, and much has been written on the subject. In 1911 Clifford White [23] shortly reviewed the literature, and found it as contradictory as the literature usually is on the subjects dealing with the internal secretions. I think there can be no doubt that excess of thyroid secretion, except that seen in connexion with exophthalmic goitre, does not interfere with fertility. It would be strange if it did, since we know there is an increase of thyroid activity during the early months of pregnancy, and possibly throughout. But it is no less a fact that women with marked exophthalmic goitre rarely become pregnant, and if they do the disease is aggravated. I remember one patient who had suffered from exophthalmos for some years, yet she had had several children, but there had always been hæmorrhage *post partum*—an occurrence which has frequently been noted in these cases. She consulted my colleague, Mr. Thelwall Thomas, and he removed one half of the thyroid gland, with the result that there was marked amelioration in her symptoms. Shortly afterwards she became pregnant again, and Mr. Thomas referred her to me for observation and treatment. She became somewhat worse than she had been since her operation, so I gave large doses of calcium lactate and ordered rest. She went comfortably to full term and there was no hæmorrhage *post partum.* I advised her not to nurse the child, which was normal. She improved very considerably after parturition and is now, so far as I know, in good health. I think it is most important that these patients should be given large doses of calcium salts if they become pregnant, as there is such an excessive excretion of lime salts in this disease, and so much danger of hæmorrhage *post partum* and even *ante partum.* Infundibulin should be given immediately after labour, to prevent bleeding.

Whether pregnancy can cause exophthalmic goitre has recently been debated. Equally eminent clinical obstetricians make diametrically opposed statements. Personally, I do not feel competent to express an opinion as to whether pregnancy can *cause* exophthalmic goitre, but I have certainly seen this disease *arise during pregnancy.* In one case, seen in consultation recently, contrary to expectation the condition did not improve after parturition. Marked improvement, however, was effected by pituitary extract; and when last I saw the patient she had no evidence of the disease beyond a somewhat rapid pulse and excitable temperament. Another case, referred to me by my colleague, Dr. Abram, occurred subsequently to parturition and to lactation, which was only possible for a few weeks. I saw her eleven months after her confinement, when there was amenorrhœa with superinvolution of the uterus. This patient, who was treated with pituitary extract, has completely recovered, and is now menstruating regularly from a uterus measuring 2¼ in. After the disappearance of all symptoms the pituitary extract was discontinued; but a fortnight later the patient returned and asked to be put back on it, as the palpitation of the heart was causing her much discomfort. She immediately responded to treatment, and is now practically well again, except for a somewhat rapid pulse, which in future I shall take as a guide to the condition of the patient, when considering the advisability of discontinuing treatment.

Pituitary Insufficiency.

We have seen that, like the thyroid, the pituitary is actively concerned in the proper development and the maintenance of the genital functions. Consequently, as we would expect, insufficiency of secretion is associated with amenorrhœa or scanty menstruation. I have already mentioned the fact that various investigators claim for different portions of the pituitary body different functions, and I have stated my belief in the unity of the whole gland. Patients with pituitary insufficiency are always obese and dull, and it is often a difficult matter to say whether the thyroid or the pituitary, or both, be at fault. Sometimes it is quite impossible to make sure, and in such cases one can only try first one and then the other extract. I have occasionally given both together, for we know from experiments that a very intimate connexion exists between these two organs. If it be true that there is atrophy of the ovary with pituitary insufficiency, as described by Cushing, it would probably be useful to give both pituitary and ovarian extract together. I have shown that ovarian atrophy does not occur with thyroid insufficiency in adults, and, therefore, I am somewhat sceptical as to the findings of Crowe and his co-workers, already alluded to, in regard to the ovaries with pituitary insufficiency. Sometimes the condition of the skin may help one in forming an opinion as to which gland is at fault. If it be dry and rough one should suspect the thyroid, if fine and smooth it is more likely that the pituitary is at fault. I have come across no case recorded in which a patient suffering from a major degree of pituitary insufficiency has become pregnant. As already mentioned, pituitary extract appears to act as well as suprarenal extract in osteomalacia, so that it is possible that there is a minor degree of insufficiency of the pituitary body in this disease.

Excess of Pituitary Secretion.

We have seen that an excess of pituitary secretion, such as occurs in acromegaly, produces masculinity, and while in the male this may give rise to excessive sexuality, in the female it causes amenorrhœa and loss of desire, as is only natural if masculinity be produced. The amenorrhœa may be spasmodic, for acromegaly tends to improve for a time and then again to retrogress. Cushing [12] has shown that eventually acromegaly (hyperpituitarism) changes into dystrophia adiposo-genitalis—a condition of pituitary insufficiency. The effect of excessive pituitary secretion must, therefore, necessarily tend to produce sterility. A case, however, has recently been recorded [15] in which a woman suffering from acromegaly conceived after having been treated before becoming pregnant with ovarian extract, which was believed to have improved her general condition and to have caused the appearance of menstruation. I have myself seen an improvement with the reappearance of the menses take place in acromegaly under ordinary circumstances. So that it is difficult to say with certainty that pregnancy resulted in the above case from the treatment with ovarian extract.

Suprarenal Insufficiency.

This condition has only received clinical recognition in Addison's disease, in which there is an extensive derangement of the metabolism. The amenorrhœa that is found in this disease is probably due partly to the general disturbances and partly to uterine atrophy. I know of no record of a proper post-mortem examination of the genital organs in this disease. Experimentally I have found a moderate grade of uterine atrophy with suprarenal insufficiency.

We have already seen that the administration of suprarenin has been successfully employed for osteomalacia. This, as I have pointed out, may be not only because suprarenin is antagonistic to the ovarian secretion, but also because in this disease there may be suprarenal insufficiency, a supposition which is supported by the fact that in one case in which I produced experimentally suprarenal insufficiency in a rabbit the bones of the forelegs became bowed. Further, in most of the animals operated on there was an enormous increase in the urinary excretion of calcium. It appears, therefore, that the secretions of the suprarenals are of great importance during pregnancy in assisting the absorption and retention of lime.

Excess of Suprarenal Secretion.

There is little to add to what has already been said concerning the sex changes that occur in adult women with suprarenal cortical hyperplasia. Amenorrhœa is a constant phenomenon, and pregnancy never occurs in well-defined cases. At present we have no remedy for suprarenal hyperplasia, but in the future some treatment may be forthcoming for the minor degrees of this condition, and this will probably be of the nature of an antagonistic combination of secretions. That there are many cases of slight hyperplasia which go unobserved seems probable, for it is a question whether the shame of a moustache or pride in masculinity has the greater weight with some women. I have such a case under observation at the present time. The patient is aged 19, her menses have ceased and she has a masculine voice and appearance. The growth of hair on the face alone is required to complete the picture.

Thymus Insufficiency.

This, so far as we know, is natural after puberty. It is possible that in cases of early retrogression of the thymus sexual precocity occurs. It is difficult, however, to know which is the cause and which the effect. Further clinical investigations should throw light on this question.

Excess of Thymus Secretion.

In the condition known as status lymphaticus there is abnormal persistence of the thymus, and since the secondary or pubescent development of the sexual organs is associated with retrogression of the thymus there is under-development of the genital organs with amenorrhœa if the thymus persist. Individuals with a persistent thymus usually die early, and I do not think the condition has as yet been considered at all seriously from the genital point of view. Retrogression of the thymus might be assisted, if the view be true that development of the genitals causes retrogression of the thymus—a question which has already been discussed.

The foregoing presentation of the very complex subject of the relation of the internal secretions to the genital processes is, I am afraid, cursory and inadequate to its importance.

I have attempted, without going more than superficially into the problems of chemical and structural correlation, to cover the whole ground within a limited space, and to bring the subject forward in a manner which might commend it for discussion to those who must continually be meeting with phenomena connected with the internal secretions, which, perhaps, have been a source of little interest or of despair owing to the unsatisfactory and limited state of our knowledge. At the same time I venture to think that the subject is now on a sound basis. Much that may seem obscure to some is even now capable of satisfactory solution if sufficient clinical investigation be carried out.

I will conclude, therefore, as I began, by suggesting that further progress can easily be made if we systematically collect and study the vast amount of clinical and pathological material which is always ready for our use.

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DISCUSSION.

Miss A. Louise McIlroy: I feel I must congratulate Dr. Blair Bell on his able paper and on the enormous amount of material he has brought forward for discussion. I speak with the humility of a learner, and if I ask for further information on several points, I do so, not in a spirit of adverse criticism, but because I could not quite grasp all the details of his lengthy paper. I shall briefly touch upon a few points in the subject, as I have already published my views in a paper to this Section in 1912.[1] In the *Journal of Obstetrics and Gynæcology*, 1913,[2] I have outlined in a review the present-day position of our knowledge of ovarian physiology. Laboratory investigators are, perhaps, in danger of becoming limited in their outlook, and liable to ignore the enormous amount of information to be found in the more strictly clinical research. Of late years, however, there has been much more collaboration between the hospital and laboratory workers, and we are beginning to question whether statements based upon the result of experimental research upon animals can always be accepted as applying to the human individual. Clinicians hitherto either purposely ignored laboratory results or accepted them without attempting to confirm them clinically. In this way errors were repeatedly published in the literature and accepted as facts until someone took the trouble to investigate them from a clinical standpoint. We want henceforward clinicians having a thorough knowledge of the physiological and pathological aspect of the special branch in which they are engaged, and working in collaboration with others who have taken up the corresponding branches of scientific research in the laboratory. It has taken some little time for research workers to accept the clinician as an equal in the scientific world. Phenomena observed among animals do not always appear in the human individual, and it is quite certain that with regard to metabolism the extent of variation is very great. As an example we have Fränkel's universally accepted statement that the corpus luteum is essential for the nutrition of the ovum. This applies, as many of us have proved, to the rabbit, but cases of oöphorectomy during early pregnancy in women, in which no subsequent interference with the progress of the pregnancy took place, prove that laboratory experience must not necessarily be made to apply clinically. Schäfer's results with pituitary extract in the production of mammary secretion cannot be obtained clinically, at least as far as my own observations are concerned.

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[1] *Proceedings*, 1912, v, pp. 342-70.

[2] *Journ. Obst. et Gynæc.*, 1913, xxiii, pp. 265-87.

That the internal secretory organs have an influence upon development is well known, both from experimental and pathological evidence. We find that removal of the gonads causes persistence of the infantile type. It is obvious that these organs are the most important of all, as they carry in addition to their secretory function that of reproduction. Castration does not tend to cause the assumption of the characteristics of the opposite sex, but of those of a common or more neutral type. There is much controversy as to the organs which are responsible for the secondary sex characteristics. What evidence is there to show that the suprarenal cortex is largely responsible? I cannot see why pathological neoplasms of the cortex when associated with sexual aberrations should be taken as proof that the normal suprarenal cortex controls the physiological onset of certain phenomena associated with the male and female individual. There is no doubt that the internal secretory organs modify the sex characteristics by their secretions, just as we find delayed onset or diminished sex development after oöphorectomy, or in cases where ovarian secretion is small in amount.

I think the secondary sex characters are decided upon at a very early stage of embryonic life, and are independent to a certain extent of the secretory organs. Such evidence as we have in cases of women with apparently normal feminine appearance, in whom the ovaries are absent or replaced by testes, point to this explanation as to an early cellular origin. It is obvious to us all that in children sex characteristics are observed at an early age. Full development of the reproductive system may depend upon glandular secretion. It is not surprising that we should find the suprarenal cortex closely related to the gonads when we consider its morphology. There is a sympathetic enlargement of this organ coincident with ovarian activity, and removal of the cortex is said to cause uterine atrophy. The cells closely resemble those of lutein tissue. When sex development is imperfect the cortex has been found to be small in size. I should like information as to the statement that no doubt all the other internal secretory organs were of the *feminine* type in one case referred to by Dr. Blair Bell. I have not come across any distinction to be drawn between male and female secretory organs other than those of the gonads themselves. An individual is not of one or other sex because of his or her internal secretory organs. There is a much more complicated and still unknown explanation somewhere. It is too easy if we solve the problem by the removal of one gland or set of glands; numerous exceptions to every observation will be found if looked for. The gonads in early embryonic life are differentiated from the soma, so that their influence must preponderate over that of the other secretory organs. There is no limit to the aberrations which may be found when we take up the study of tumour growths and their variations. We know nothing about their influence upon metabolism, or even the character of their secretions. Does enlargement of a gland mean increased or decreased secretion on the part of that organ? We cannot definitely discuss its stimulating or inhibitory action. Tumours of the ovary in children may cause precocious sex development, and yet we cannot use this as evidence for the proof of statements as to the physiological function of the ovary.

I am much interested in Dr. Blair Bell's experience of thyroidectomy as a cause of marked uterine atrophy. In young animals this is to be expected, as there is deficient development physically and often mentally in defective thyroid secretion. In the adult animal I should like further details. In the experiments upon pregnant animals for research upon eclampsia, it is stated that these did better than the non-pregnant. I should have expected abortion to occur if there is such an involvement of uterine nutrition. I cannot find any reference to this point in Biedl's latest edition. Perhaps Mr. Berry can enlighten us as to corresponding results in women. Cases of goitre after oöphorectomy are well known. In Professor Noel Paton's experiments upon removal of the thymus hypertrophy occurred in the testes, but not in the ovaries. This requires further investigation, as it somewhat bears out Steinach's views as to the specific character of gonad secretion. We cannot say that the thymus secretion is antagonistic, as it carries out a certain function in regard to growth until handed over to the reproductive organs, and in their absence is still continued. Our knowledge of pituitary influence is still vague. In some conditions there is precocious sex development; in others, such as in giants, there is sometimes defective development of the reproductive organs.

As gynæcologists the ovary most concerns us, and the field for research is wide. The corpus luteum has a trophic influence upon the fertilization and embedding of the ovum, but to what extent we are in ignorance. The interstitial cells are important from an internal secretion point of view, as I have endeavoured to show experimentally that they control the nutrition of the uterus and other generative organisms when grafted from their normal position. Their function is not as yet proved. I am endeavouring to do so without surgical injury to other structures by means of X-rays. Ovarian secretion is not necessary for the maintenance of mammary secretion as proved by Dr. Amand Routh and others. The most important question in the present discussion is the advisability of conservation of the ovaries in view of their value in the economy of the individual. Workers upon physiological lines are unanimous as to their importance, but it will be of interest to hear statements to the contrary, which we hope will be illustrated by proof. Experimentally, removal causes atrophy or arrest of development of the reproductive organs, arrest of menstruation, or pro-œstrus and sterility. Changes occur in the metabolism of the animal. Clinically, we want much further information as to the ultimate results of operations, so that we may be guided by a full knowledge of the subject in our operative treatment. I can find no records of double oöphorectomy and its results among children. During pregnancy abortion may occur if early among rodents, but not necessarily in the human female. After oöphorectomy menstruation ceases without a doubt; statements as to the contrary are to be questioned and the presence of uterine hæmorrhage discussed. In my experience the younger the patient the worse the menopausal symptoms. It is interesting to hear Dr. Blair Bell's suggestion as to gauging the degree of femininity (as he interprets the term) beforehand. I fear few surgeons are capable of such a procedure. The spasmodic effects of the menopause are to be explained by their cyclic occurrence corresponding to the return of the menstrual period, had not operation been performed. I have observed this in numerous patients, more especially in the surgical menopause, the patients frequently volunteering the information themselves. No other organ but the ovary can take up the function of menstruation, although it can influence it. Clinical records are necessary as to the effect of oöphorectomy with or without hysterectomy. The uterus is an organ for excretion of metabolic products as well as for embedding of the ovum. It is, therefore, most active during menstruation in its excretion of toxic products from the ovaries. When the menopause occurs the question is whether the symptoms are due to decreased ovarian or uterine secretion. Does the uterus show physiological degenerative changes before the ovaries alter in their secretions? That the uterine secretion has no effect upon the ovaries has been proved by experiments of myself and others. French surgeons recommend the removal of only part of the uterus when possible, so as to modify menopausal symptoms mainly on account of its excretory function. Even a portion of the cervix seems to be of benefit, I have found in my operative work. It has been stated by Bond that uterine secretion has an effect upon the organism. This I question from my own work. In conditions of hæmatocolpos there is no evidence clinically further than the local condition. In cases of menstruation with sickness and vomiting the uterine secretion is frequently scanty, and in cases of defective development of the uterus with normal ovaries menstrual molimina are sometimes observed, all of which point to the failure of the uterus as an organ for excretion of toxic products. Menopausal symptoms are to be classified as such, as they are always much relieved by the return of an isolated menstrual period. For such conditions associated with toxæmia, such as menstrual epilepsy, I am inclined to advocate an occasional blood-letting for the relief of symptoms. In operative work it is hardly necessary to state that one ovary, or a piece of one, has the same function as both organs, compensatory hypertrophy taking place.

With regard to ovarian grafting, I agree with Dr. Blair Bell that we obtain a mitigation of the menopausal symptoms; but, as he states, it is very seldom required, and practically only in those infective cases where we remove the ovary to a healthy site, and from one where, if left, would still remain a source of irritation due to the cyclic congestive conditions of the organ. Small pieces transplanted to the recti muscles are found to do well. I have had no experience of any but autogenous grafts in the human subject.

Constitutional disturbances occur during menstruation and at the menopause which prove the influence of ovarian secretion upon metabolism. After oöphorectomy fat is deposited and there is a loss of energy. The result of observations upon the metabolism of the internal secretory organs is so contradictory that I can speak with no authority. The statement that the nitrogen output is increased after oöphorectomy is open to question. In some of our work in the Royal Infirmary Clinic upon menstruation we found increased nitrogen excretion before the onset of menstruation, and diminution when the flow became established. This increase pointed to the period of most active ovarian function or the pre-menstrual period.

As to the inorganic salts, Dr. Blair Bell is an authority on calcium and I cannot criticize his statements further than to state that in my experiments, which were confined to two dogs, I found calcium retention diminished after oöphorectomy. It may be an error on my part, but I made my observations over a considerable period of time and chose the dog as an animal specially fitted for metabolic work. Much stress has been laid upon the calcium variation in women, but I should like some evidence as to the proof of the statement that it is stable and invariable in men during the reproductive period of life. Some of the experiments showing calcium variation have been carried out upon male animals before and after castration. What is the evidence for calcium retention in old age other than atheroma of the arteries? At the present stage of our knowledge of metabolism, a subject which is in its infancy, we must consider other factors in the production of calcium, as, for instance, the question of inorganic salt secretion due to the compensatory influence of the thyroid gland. Is hypertrophy of a secretory organ sufficient to account for increased secretion? Our methods of estimation are still somewhat crude.

The disorders of menstruation as influenced by the internal secretory organs are various. Precocious menstruation may be due to increased ovarian activity. In such cases the stature is frequently stunted. In delayed menstruation the subjects are usually tall girls, proving the influence upon bone growth. Menorrhagia of puberty may be due to derangements of secretory organs, more especially the pituitary and thyroid. In cases of early menopause there may be deficient thyroid secretion as well as ovarian secretion.

Treatment of gynæcological conditions by glandular extracts is now fairly extensively practised. Ovarian extract, more especially when made from the corpus luteum, I have found of benefit in menopausal symptoms. Latterly I have tried a preparation of mammary and ovarian substance with very encouraging results. In uterine hæmorrhage I have been giving pituitary extract by the mouth, 2-gr. doses twice daily, and the effect has been remarkable in some cases, especially in the menorrhagia of young girls. Thyroid extract in menstrual epilepsy and in amenorrhœa is to be recommended. I cannot agree as to its inefficiency in pregnancy. By its administration I have seen albumin in the urine clear up in a few days, and threatened symptoms of eclampsia become suppressed. In a study of the internal secretory organs we must, to a certain extent, include that of toxic conditions, as they are closely related and confusion may arise. The enlargement of the thyroid during menstruation and pregnancy is most probably due to the added strain upon the organism of the toxins generated by the ovary or the embedding ovum, and the thyroid, in its endeavours to counteract this, takes on added function. I have no proof for such a statement, it is merely a suggestion. I have observed enlargement of the thyroid during pregnancy and I have seen a goitre cured and then return on the occurrence of pregnancy. The symptoms of the menopause are closely allied to those of a toxæmia. Tenderness in the breasts before the onset of menstruation is explained by toxic products secreted by the ovary, as it occurs in the most active stage of the latter organ.

I have found pituitary extract has a beneficial effect in the treatment of septic conditions, most probably from its diuretic and contractile action. That the pituitary has a complicated physiological function is proved by experiments on extracts from other than the infundibular portion. I should not have looked upon it as one organ, from its developmental and physiological aspects.

Dr. F. H. A. MARSHALL (Cambridge) laid great stress upon the necessity for prolonged and careful investigation before accepting any conclusions regarding the nature of the functional correlation between the generative organs and other organs of internal secretion, and illustrated his remarks by reference to the unsatisfactory state of our knowledge upon the relation between the testes and the thymus, and the theories which had been formulated about this relation upon insufficient evidence.

Dr. Marshall next referred to the question of femininity and alluded to Steinach's experiments in which ovaries had been transplanted into previously castrated male guinea-pigs. Dr. Marshall agreed with Dr. Blair Bell that femininity cannot be defined merely by the presence of ovaries. Dr. Marshall stated that extirpation of ovaries in ewes belonging to a breed of sexually differentiated sheep did not lead to the assumption of male characters, but that, on the other hand, Goodale had described experiments in which the removal of the ovary in a duck was followed by the acquirement of male plumage.

Dr. Marshall concluded by an account of the functional correlation which exists between the corpora lutea and the uterus and mammary glands, and pointed out that a relationship of this character must have developed gradually in the course of evolution through the tissues of the organs acted upon becoming susceptible to stimulation by substances secreted by the activating organ, and that consequently we might expect a co-ordination of this kind to be present in a somewhat imperfect form in certain individuals.

Dr. T. R. Elliott, F.R.S., urged that the general conclusions which thinkers on this new problem were endeavouring to establish should be received with much caution. The new knowledge was being sought along two lines of inquiry, that by clinical observation and that by animal experiment. Clinicians had done splendid work in recognizing types of disease that were associated with special changes in the ductless glands, and it was from them that the suggestion had been pressed as to the possibility of some essential relationship in function between the various glands. But to weave these observations into a system of precise knowledge was a difficult task, for the work of the clinician was perforce individual, both in respect of the patient and the observer ; it was often bound to be hasty and imperfectly reasoned, because the patient must receive some diagnosis and treatment. Hence came the request for aid from the experimental method with animals, a method that could repeat its observations again and yet again, and delay the answer until completely confident of the right solution. Practical medicine must act at once, and therefore could always be forgiven a mistake. Scientific workers in the laboratory were granted time, a mistake with them was unpardonable, and they should not attempt to teach to Medicine until assured that they had found and proved the truth.

In this matter of the ductless glands and their relationship to the genital functions there was more speculation than sound knowledge abroad, and it was necessary to test all with a very open mind. On the clinical side good reasons could be given for believing in the probability of such a relationship, the arguments from morphological history supported the surmise, but Dr. Elliott thought that the evidence from animal experiments was as yet entirely indecisive. Nothing had been proved either for or against the theory. Impatient for the aid that was so long delayed, clinicians themselves, with an admirable enthusiasm, had entered the laboratories and attempted to win knowledge of the physiological laws that govern the phenomena of disease. But here they were especially handicapped by the clinical habit of mind, the desire for prompt diagnosis and action which led them to hasty conclusions and insecure generalizations. It was therefore especially necessary that their teaching should be tested critically by the pure physiologist and the pure pathologist, before it could be accepted by those concerned with the practice of medicine. Evidence had been collected in the last twenty years which proved beyond doubt that the medulla of the adrenal glands is essentially a part of the nervous system. Very crudely, this tissue might be regarded as a mass of secreting ganglion cells, belonging to the sympathetic nervous system, which had assumed a glandular function. For the cortex of the gland he could only say that there was no proof either that it was, or that it was not, connected with the function of the medulla.

The Viennese school had tried to show that other ductless glands were connected with other divisions of the nervous system, such as the thyroid with the vagus, and from the known antagonism between the vagus and the sympathetic, they deduced a like antagonism between pairs of ductless glands. This antagonism was absolutely unproven, all the known facts could be equally explained on the view that the glands are mutually adjuvant and enlarge to help each other's deficiencies. So too there was no shadow of proof that the glands, other than the adrenal medulla, are associated with special divisions of the nervous system. Indeed, if such were the case, it would be improbable that they would be related also to the genital functions, and the discussion of that evening would find its subject melting into thin air.

It was an amazing thing which Medicine had suggested, that gland cells at the base of the brain, on the front of the throat, close to the kidneys, and embedded in the substance of the genital organs, were all connected with one another and exerted a mysterious and combined influence over growth and the reproductive functions. Experimentally it certainly was not proved, and he thought that almost all Dr. Blair Bell's observations were open to serious criticism which deprived them of the importance with which his zealous enthusiasm naturally invested them. But embryology and comparative morphology gave their support to this view. The interstitial fatty cells of the testis and the fat-laden cells of the adrenal cortex were derived from a common mass of tissue at the back of the abdomen, and vestiges of this were found through life in the fragments of adrenal cortex that may be strewn on the line from kidney to the descended sex gland. Animals below the vertebrates might possess in each segment a glandular mass of cells associated with the genital and excreting organs of each segment. Evolution caused the genital and excreting organs to disappear from most of the segments and be concentrated at a particular level. But the glandular masses tended to persist in their original wide serial distribution, in what a German might style a genito-excretory-growth-governing system. Gaskell's great theory traced their growth from the coxal glands of the arthropod to form the pituitary, the thyroid, and the adrenal cortex of the mammal. Fresh functions were assumed with the evolution of each gland ; at the back of all doubtless rested the old power to influence growth and reproduction. But the adrenal medulla must be excluded from this possible series, and in consequence adrenalin was unlikely to be of use in the therapy of their disease.

Work in the next few years would have a fascinating tale to tell, when the history and dominion of these glands were fully known. Two chief temptations were liable to lead thinkers astray from that great goal. Any Sir Launcelot might, with but little blame, yield to the lure of the seductive theory and fall away from his honest allegiance to proved facts. The other was a less knightly fault, of the man who, in the phrase of Kipling, " Stinting the work half finished, for the instant meed of praise," asserted that proof had been given, where the proof was sadly short of completeness. The so-called literature of the ductless glands illustrated both these errors in abundance.

Mr. JAMES BERRY said that with regard to the relation between the thyroid gland and the female sexual functions, he felt that he was unable to draw any definite conclusions or to make any generalizations founded upon a sufficiently firm basis of fact. His ideas on the subject were still in a nebulous condition and he doubted, therefore, whether anything he could say would add much to the value of the debate. He would but bring forward a few clinical observations and leave to others the interpretation of them. No one, he thought, who saw much of thyroid disease could doubt that there existed some very intimate connexion between the thyroid gland and the female reproductive organs. One great fact, to begin with, was the much greater frequency of thyroid diseases of nearly all kinds in the female than in the male. In his own experience operations for goitre were about eight times as common in female as in male subjects. Of 103 operations for the removal of goitre that he had performed during the present year only eleven were on male patients, and these figures were practically in accordance with larger statistics that he had published on previous occasions. Although there were no doubt other reasons which accounted to a large extent for this greater frequency in women, yet there was certainly a large minority of cases in which disease of the thyroid appeared to be directly dependent upon some abnormality of the sexual functions. Although he was unable to confirm the common statement that the thyroid enlarged during menstruation, he thought it not unlikely that this did occur. It was quite common for patients with small parenchymatous goitres to tell him that these became larger during menstruation. Sometimes they caused respiratory trouble only at these times.

A common type of case was that of a girl of about 14 to 17 years of age, brought to him on account of a slight general enlargement of the thyroid. In many of such cases it was found that menstruation had not been fully established; the goitre would generally be found to disappear when this function became regular and natural. It was a curious but well-known point that the severe suffocative form of parenchymatous goitre that occurred at puberty and that sometimes caused death from asphyxia, if not promptly treated, was as common among boys as among girls. This was probably to be explained by the relatively greater enlargement of the larynx and trachea at puberty in boys.

With regard to pregnancy, it was quite common for goitrous women to state that their goitres got larger during this condition. Dr. Blair Bell had mentioned the enlargement of the thyroid during the early months of pregnancy. In most of the cases that came under his own notice, however, the enlargement and consequent dyspnœa, occurred during the later months of pregnancy. He thought they were due not to any increased activity in this function of the organ, but rather to accumulation of fluid secretion in cysts or to blood extravasations, both extremely common complications of ordinary goitre of long standing.

In an endeavour to ascertain whether the thyroid usually enlarged during pregnancy, he had many years ago carefully examined the necks of forty pregnant women in the midwifery out-patient department of one of the larger London hospitals. In only two of the forty women had he been able to detect any enlargement whatever, and he did not think that this was a larger proportion than would be found among forty non-pregnant women anywhere in London. The cases examined by him were mostly at about the seventh or eighth month of pregnancy.

Passing to another subject, he had noticed that in another very common class of case, that of a woman, aged between 30 and 50, with a cystic or adenomatous goitre, the patients were seldom women who had married at an early age and borne children. The woman with a goitre that caused dyspnœa or other serious trouble was usually either unmarried or a widow, or had never borne children, or was separated from her husband, or in some way or other was not living what might be called a normal sexual life. He had been much impressed by this fact.

He would like to add a word of warning against the error that he thought was often made by clinicians, that of assuming that an enlargement of the thyroid gland meant necessarily a hypertrophy of the organ. As a matter of fact, the vast majority of thyroid enlargements betokened not hypertrophy and increased function of the gland, but really atrophy of secreting elements and consequent *diminution* of function. Such was certainly the case with most forms of the so-called parenchymatous goitre, and of course with cystic, adenomatous and other degenerative forms of thyroid disease. The goitre of Graves's disease, on the other hand, was probably an exception, as in this kind of goitre there was an enormous increase in the epithelial elements. Even here, however, we probably had to deal with an abnormal secretion rather than with mere increase in secretion due to simple hypertrophy. As to the effects produced by complete removal of the thyroid gland, he was not able to say anything from his personal experience, although he had seen a good many cases in which this had been performed by others. He had never himself performed such an operation, and did not think there were any cases in which it was justifiable in the human subject, with the possible exception of certain very rare cases of malignant disease.

Dr. Leonard Williams said that Dr. Blair Bell had insisted upon what he termed the unity of the pituitary gland; he presumed he meant its physiological unity. This seemed to be a strange and rather retrograde doctrine, and if he was right, a very depressing one. He (the speaker) had often wished that there were some anatomical or experimental excuse for splitting the thyroid into those constituent parts of which he, for one, was quite sure it was composed. He had hoped that the process of differentiation which had been applied to the pituitary would eventually show the way to a similar differentiation in the case of the thyroid, for he was convinced not only that the thyroid was a compound gland endowed with several functions, but that it varied the exercise of those several functions in response to various stimuli, both physiological and pathological. For this reason he did not think it scientific to speak of thyroid insufficiency and thyroid excess. Such a classification was no doubt very convenient, and in the present state of our knowledge was pardonable; but in medicine the tendency was to become slavish to primitive classifications, and he hoped that this one would soon disappear to make room for something better. At present there was a state of chaos, and he did not think that any escape therefrom would be possible until our minds were divested of the idea of unity of function in these glands.

As an illustration, Dr. Leonard Williams thought it interesting to compare Dr. Blair Bell's paper with a pamphlet by Dr. Hertoghe, of Antwerp, entitled "Les Insuffisances Thyroidiennes" (observe the plural), a most instructive paper by a very accurate observer. Under the heading of "Thyroid Insufficiency" Dr. Blair Bell had said: "Thyroid insufficiency always causes a decrease in or the complete cessation of the function of menstruation, according to the degree of insufficiency." On the other hand, Hertoghe says: "As a general rule thyroid insufficiency shows itself by menorrhagia, often alarming in its degree. The administration of thyroid extract checks the discharge. By forcing the dose it is even possible to cause complete disappearance of the menstrual phenomenon. When you meet a woman with excessive catamenial discharge, and you are able to exclude such everyday causes as fibroid, cancer and placental retention, do not forget thyroid insufficiency, and be careful in your search for confirmatory evidence of its existence." This was a startling instance of those contradictions in the literature of the ductless glands to which Dr. Blair Bell himself had referred, and it seemed to him that until our point of view was changed the contradictions would remain.

He believed the thyroid gland to be composite in its functions. The thyroid essence played many parts. It presided, for example, over the nutrition of the skin and its appendages; it was deeply concerned with general metabolism, and especially with calcium metabolism; it was engaged in the development and continuance of the sexual functions, especially the female sexual function; for Gaskell has shown that the thyroid gland of vertebrates is derived from the uterus of the palæostracean ancestor; it was closely connected with the maintenance of the heat of the body; it constituted one of our main defences against toxic invasion; it was essential to smooth working of the central nervous system, more especially the higher functions of the brain; and it antagonized or reinforced the action of some, if not all, of the other ductless glands. Now, a gland with all these functions—and it would be possible to add others—was surely not as simple as its structure would lead us to suppose, and he contended that as long as we persisted in treating it as a unity instead of recognizing it as a pluralist, we should miss the key to the problems which its pathology presented.

It might be admitted at once that all these functions might become profoundly depressed simultaneously. That was seen after complete removal of the gland, and in very confirmed myxœdema; but, speaking as one who had taken a great interest in the matter, he could say that it was very rare to find a case of thyroid insufficiency in which all, or even most, of these functions were attacked. What usually happened was that some were attacked, some were stimulated, while others remained neutral. One might, for example, find hardening of the muscles, somnolence, deliberate speech, slow pulse and subnormal temperature associated with a perfectly normal skin and dermal appendages; or there might be a normal general appearance and normal pulse-rate with purely subjective symptoms, such as defective memory, want of concentration, and intolerance of cold—the combinations were almost infinite. Each individual symptom might be slight: it was the combination of several, or many, which was suggestive, and this might be associated with evidences of slight excess in other directions. There was thus obviously not one insufficiency, but many insufficiencies, and it was as unlikely that the same combination of insufficiencies should be met with in any two patients as it was for a person to hold exactly the same hand at bridge, though he played several rubbers every night for a year.

What seemed to happen was that in response to some disturbing influence, say the withdrawal of the ovarian stimulus at the climacteric or the result of an acute specific, the ordinary equilibrium of the various thyroid functions was upset, some of them becoming depressed, others over-active, while some remained stationary. Except after operation or complete atrophy, there was no such thing as a general insufficiency of the gland; and under no circumstances that he knew of was there ever such a thing as a uniform pathological excess of all its functions. And if this view was correct, it threw much light on many dark places. It explained the contradictions typified by Dr. Blair Bell's view and Hertoghe's with regard to menstruation. It explained the condition which the French call dysthyroidism, in which the sleepy gland appeared ever and again to rouse itself to a very orgie of secretory activity, and then drop suddenly and sullenly to sleep again. In reality the whole gland did not go to sleep; it was merely that there was a want of equilibrium between the two sets of functions, a see-saw in which one set was now in the ascendant, and anon another. It explained why the gland, or portions of it, were found to be enlarged in so many cases of definite hypothyroidism, and why the enlargement so often disappears under the regulating influence of extracts of the whole gland. It also explained those otherwise altogether inexplicable cases in which we have symptoms of myxœdema co-existing with those of Graves's disease, two conditions which on the present classification of excess and insufficiency were mutually exclusive. There must surely be something wrong with a classification which declares in one breath that we have had too much champagne, and yet too little.

Nor did a consideration of Graves's disease itself offer any real difficulty to the adoption of this view. He would not go so far as to say that Graves's disease was due to thyroid inadequacy, but he considered that such a description of it would be quite as accurate as that which proclaimed it as due solely to thyroid excess. The only two factors in Graves's disease which to his mind were essential to the diagnosis were the circulatory phenomena and the mental phenomena. These were in excess always; but in mild cases, though we might find some exophthalmos, some thyroid enlargement and other evidences of excess, we were quite as likely to find loss of hair, especially of the eyebrows, swelling of the eyelids, sudden flushes of heat, transitory œdema, and even solid œdema as described by Basedow himself, all of which were eminently characteristic of thyroid insufficiency. It was only that the symptoms of excess were so very active, obtrusive, and often alarming, that they overshadowed the concomitant signs of insufficiency, and unless the latter were carefully sought they might easily escape notice. Since he had been looking for signs of insufficiency in Graves's disease, he had seldom failed to find them.

Now, he might be asked, if this be the case, how was it that so few cases of Graves's disease benefited by the regulating influence of thyroid extract? That was a very pertinent question, to which he would thus venture to reply. In the first place, quite a large number of patients suffering from Graves's disease did benefit very materially by the administration of suitable doses of thyroid extract, though many, probably the majority, did not. In the second, quite a large number of those suffering from definite thyroid inadequacy failed to obtain any benefit whatever, though the vast majority were easily cured. This meant that our attempts to restore the disordered balance were only partially and occasionally successful. And the reason seemed to be that there was something wrong with the remedy. We used the gland of the sheep, a herbivorous animal, famous neither for courage nor originality. It was very active where the skin and hair were concerned, but less so where other functions were concerned. He (the speaker) had tried the thyroid of the pig, an omnivorous animal, and found it inert. Some had tried the gland of the ox, others that of the dog, all with very indifferent results. And not only was this the case with the thyroid, it was true of the suprarenal and pituitary as given by the mouth. It was most conspicuously the case with ovarian extract, from which, though given heroically with patience and perseverance, he had never obtained any results of any kind whatever, good, bad, or indifferent.

In the case of Graves's disease it was a significant fact that the one remedy in which he, amongst others, had learned to have confidence was iodine, a normal constituent of the healthy glandular secretion, and therefore presumably a stimulant to its activities.

The thyroid he believed to be the master gland in the endocrinous system, and until we had captured this citadel by learning to differentiate between its functions, he feared that all the study which we might lavish on the others would be wholly or partially in vain.

Dr. R. MURRAY LESLIE was impressed with the importance of the subject of discussion from the point of view of the general physician and was indebted to Dr. Blair Bell's and Miss McIlroy's able and suggestive papers for much valuable information. He entirely joined issue with Dr. Elliott in regard to the latter's remarks on the unreliability of *clinical evidence* in respect to the effects of internal secretions. There was much divergence of opinion, as Professor Marshall and other speakers had pointed out, in regard to the interpretation of experimental data, owing to the fact that the homologous glands of the lower animals had not precisely the same structure and functions as the corresponding glands in the human subject; this was clearly indicated in the sections of the thyroid, pituitary and ovary of cats and rabbits shown by Dr. Blair Bell with the epidiascope. On the other hand, no one doubted the accuracy of the definite correlation of the internal secretions of the thyroid gland, suprarenal body, and pituitary gland with the morbid human conditions known as myxœdema, Addison's disease, acromegaly and of the relationship between the functional activity of the ovary with the phenomena of female adolescence and the menopause, all of which facts we owe almost entirely to the critical insight of pure clinicians. Indeed, Professor Swale Vincent in his well-known textbook on "Internal Secretions" stated that the most valuable knowledge regarding internal secretions in the human subject would be obtained by careful and methodical study of clinical conditions in association with patient investigation of pathological findings, including microscopical examination of the glandular cell-contents. Operative procedures on the ovaries, uterus and its adnexa, followed by careful observation of the resulting physical and psychical manifestations, had thrown a flood of light on the problems of femininity and the conditions influencing the functional health of women. The speaker was much interested in Mr. Berry's important statement in regard to the enormous sex preponderance of pathological conditions of the thyroid gland and their frequent relation to spinsterhood and widowhood and other conditions influencing functional inactivity of the ovaries. His conclusions strongly supported Dr. Blair Bell's view of the relation of normal femininity to anatomical integrity and secretory activity of the non-gonad endocrinous glands. Much similar valuable information would be obtained from carefully recorded observations by other independent clinicians working in their own special departments. Such work was essential, as at present there was not a sufficient number of clinical facts available on which the biometric statistician could base definite conclusions.

In regard to *pulmonary tuberculosis*, the speaker had frequently noted the tendency of the disease to remain quiescent during the period of pregnancy, when, as Dr. Blair Bell stated, the thyroid gland was specially active in the early stages and the suprarenals and pituitary in the later stages. Might it not be that such characteristic alterations in the secretion of these endocrinous glands and the resulting changes in maternal metabolism exercised a counteracting influence in regard to the toxæmia of tuberculosis and other organismal processes? It was conceivable that during the cessation of ovarian activity in pregnancy the character of the internal secretions and the degree of calcium metabolism might be so altered as to conserve the strength of the mother until the birth of the child. The tendency of tuberculosis to relapse after pregnancy was equally significant, and the question arose as to whether it might not be advisable to administer thyroid or pituitary extract to tuberculous nursing mothers during and after the puerperium.

One of the most interesting points raised by Dr. Blair Bell was the curious *sex selection* which he stated was exhibited by certain internal secretions. Thus he said that sexual precocity, which was produced in boys by pathological conditions of certain non-gonad endocrinous glands, (e.g., the suprarenal and pineal bodies) did not occur in girls, but was represented instead by the assumption of male characteristics, and that sexual precocity in girls could only be induced by pathological conditions or functional over-activity of the gonads (ovaries). These facts, if correct, might have an important bearing on the question of sex inheritance, in regard to which Professor Bateson, of Cambridge, had recently published some interesting observations, more particularly in relation to sex-limited diseases and functional peculiarities—e.g., colour-blindness. It might be that the factor of "femaleness" consisted essentially in a specially developed correlation of the gonads with other endocrinous glands, the absence of such correlation tending to the assumption of male secondary characters. On the other hand, Miss McIlroy indicated that secondary sex characteristics, such as are involved in femininity, were decided at a very early age of development before the endocrinous glands became definitely differentiated. The speaker had had the opportunity of observing in a series of cases the effects of *hypo- and hyper-thyroidism* (not amounting to actual myxœdema or Graves's disease) on the menstrual functions, though the facts collected were not sufficiently numerous to found definite conclusions, except that they strongly suggested that the thyroid gland possessed at least two internal secretions, one excitory and the other inhibitory. Some of his cases of hyperthroidism had been associated with extreme menorrhagia and others with partial amenorrhœa. In cases where menorrhagia was a marked symptom there was frequently a tendency to great irritability of the heart. One of these cases was now being treated with injections of pituitary extract. In the treatment of obstinate cases of amenorrhœa, suggesting functional ovarian activity, the ovaries might really be normal, the fault lying in deficient secretory activity of one of the non-gonads—e.g., the thyroid or the pituitary. The clinical observation recorded by Dr. Blair Bell that in hypothyroidism the skin was rough and dry, and in hypopituitarism fine and smooth, might be of assistance in determining when to give the thyroid and when the pituitary extract in appropriate cases.

From the *therapeutic aspect* the most important point raised in the opening paper was probably the suggested value of giving combined extracts in the treatment of amenorrhœa and other disordered sex functions. The speaker had recently a case under observation of a girl, aged 25, who a year or two previously had developed almost complete amenorrhœa associated with extreme adiposity and growth of hair on the face and body. The ordinary remedies, including iron and arsenic, had proved futile, but an administration of combined thyroid and ovarian extract produced an almost instantaneous effect. The menstruation returned and became quite normal, the adiposity became much reduced, while the general hirsute condition of the skin almost entirely disappeared. It was probably a case of hypothyroidism.

Ovarian extract alone had probably but a limited therapeutic value, though it sometimes seemed to be efficacious as an adjuvant in the treatment of the disorders of the menopause, although at the same time even better results might be obtained by using orchitic extract in the treatment of climacteric neurasthenia and psychasthenia.

It seemed germane to the subject of discussion to refer briefly to the possible *relation of cancer* growth in women to *defective correlation of internal secretions.* The question had been raised in this country by Dr. A. S. F. Grünbaum and by Ehrlich on the Continent. Ehrlich thought that in normal conditions there were substances circulating in the organism derived from internal secretions, which might stimulate the body cells to resist the "arthreptic influence of cancer cells." At the menopause the correlation balance was necessarily upset for the time by the cessation of ovarian activity, and if Ehrlich's view was correct it would only be natural to expect a prevalence of carcinoma in the post-climacteric era. The occurrence of carcinoma in women in early adult life might be due to some obscure interference with the correlation balance of the associated endocrinous glands. The speaker had recently under his observation a case of inoperable cancer in a woman, aged 28, who six months before the formation of the cancer developed amenorrhœa associated with the appearance of hair on the face and body, indicating altered activity of the internal secretions. It would be interesting to have the experience of gynæcologists as to the prevalence of carcinoma among women in whom an artificial menopause had been induced by the removal of the generative glands. Were the fact proved that there was no tendency to early carcinoma in such patients it might only indicate that the establishment of a secondary correlation after the cessation of ovarian activity was more readily established in younger individuals. Carcinoma in women occurred ten years earlier than in men.

Dr. Florence Stoney spoke of her experience of amenorrhœa in connexion with exophthalmic goitre. She had seen over 100 cases of this disease in the last five and a half years. It was in the younger acute cases that amenorrhœa occurred. The monthly periods, which had often been absent for months before treatment, appeared almost at once when X-rays were applied to the goitre, the first improvement noted in the patient being usually the return of the menses. The following were a few typical examples:—

(1) T. B., a very stubborn case, aged 29, had amenorrhœa for six months before being sent to Dr. Stoney. Thirteen days after the first X-ray dose the menses started and have been almost regular since for the last two years.

(2) A. B., aged 31. Amenorrhœa five months till X-rays were started, since when, for the last nine months, she has only missed once in spite of very acute exophthalmic goitre.

(3) M. H., aged 24. Very acute. Periods hardly seen for several months till she started X-rays. Six weeks later her periods were better than for a long time, and continued regular until she married and became pregnant a year later. The periods have started again since her confinement.

(4) M. F., aged 20. Amenorrhœa eleven months. The periods started regularly as soon as X-rays were applied. This girl was not yet well, though she was better and her periods continued regularly.

(5) E. B., aged 19, came with a history of five months, amenorrhœa. One week after the first X-ray treatment to her goitre the menses reappeared and have continued regularly.

Dr. Amand Routh congratulated Dr. Blair Bell upon his admirable paper. He had not only detailed the facts generally known to those who were familiar with the present views of the bio-chemical relations existing between the ductless glands and the female generative organs, but he had helped to arrive at that knowledge by his own researches. It was comparatively a new idea that a woman was a complex individual, whose functions, even those of the pelvic organs, could only be developed, maintained and regulated if the ductless glands throughout the body were working harmoniously. This view opened up a vista of clinical possibilities, both as regards prophylaxis and treatment, and was likely, when fully proved and understood, to revolutionize gynæcology and obstetric toxæmias.

Dr. Blair Bell said that "precocious puberty in females is only associated with tumours or hyperplasia of the gonads, and not due to lesions of the other ductless glands." This statement was, perhaps, hardly justified by our present knowledge.

Dr. Routh alluded to the case of a patient, aged 18, whom he had first seen when aged 7 for menorrhagia, and for attacks of severe headache, giddiness and nausea recurring independently of her periods. The external genitalia were as developed, pigmented, and hirsute as in a woman aged 35. The uterus was rather large, and both ovaries could be palpated *per rectum*, and seemed quite normal. The only other functional abnormality discovered was that, during her headaches, the excretion of urea diminished enormously, reaching only 167 gr. *per diem* on one occasion. A curious result of testing her urine occurred a few months ago when the patient was aged 17. The expert who examined the urine stated that spermatozoa were undoubtedly present. The urine had been collected just after the period had started. She was a boarder at a girls' school, and had not been out of sight of her teacher. Was it possible that her genital glands were testes, and that she was a true hermaphrodite? Spermatozoa were not found at her next period.

The question of whether *ovulation* occurs during pregnancy was an interesting one. There were arguments both for and against, but the clinical evidence was against it, for ovaries which had been removed during pregnancy or examined at Cæsarean section, &c., only showed the one ruptured Graafian follicle with lutein excess.

The author stated that mastodynia associated with menstruation was relieved by thyroid extract, and therefore thought that the pain and swelling of the breast was indirectly due to thyroid insufficiency. But Dr. Bell said elsewhere that hyperthyroidism might produce excessive menstruation, so perhaps the thyroid administered in his case had hastened the onset of menstruation and had thus lowered the mammary vascular tension. Dr. Routh believed that ante-menstrual mastodynia was due to ovulation and to the direct action of the formation of lutein tissue, for Schäfer had shown that the latter stimulated mammary activity. He had two patients whose breasts became very swollen and painful about ten days before menstruation, becoming quite soft and painless about three days before the flow started. One of these patients was unmarried, but the other had had three children, which had each arrived a fortnight after they were expected. This confirmed the view that ovulation was the cause of the mastodynia.

The tendency of the present age was to cure both gynæcological and obstetrical maladies by other means than surgery, and if to the relief of fibromata by X-rays, of carcinoma uteri by radium, we were to add the cure of osteomalacia by suprarenal extract, and the relief of other abnormal genital functions by extract from other ductless glands, still more good would follow. If the correlation was so intimate as Dr. Blair Bell stated between the uterus and ovaries and the other ductless glands, these structures must almost be looked upon as links in a biochemical chain, and we must be even more careful to avoid double oöphorectomy than hitherto, for such an operation had not only to be considered from the ovarian point of view, but from that of the functions of all the other ductless glands, for their metabolism might be seriously affected by the exclusion of the ovarian link.

Dr. HENRY R. HARROWER called attention to the fact that the administration of ovarian extract in several cases of amenorrhœa which had come under his notice caused a considerable increase in the total urinary solids, and emphasized the evident increase in the metabolic activities which frequently follows its administration. He also referred to Dr. Blair Bell's suggestion that the diminished seriousness of the results following thyroid ablation in pregnant cats was due to the fœtal internal secretion replacing that of the removed organ. Confirmation of this was to be found in the communication of Lafon to the Society of Biology of Paris, at a meeting held on October 18,[1] in which he reported extirpating the pancreas of a pregnant bitch with no resulting glycosuria *until the uterine contents were removed.* This investigator also presumed that this phenomenon was due to perfusion of the fœtal pancreatic internal secretion into the blood of the mother.

He was especially glad to notice Dr. Bell's intimation that the use of certain combinations of animal extracts were likely to prove of better therapeutic service than ovarian or luteal extracts alone, and suggested that the results, or lack of results, not uncommonly following ovarian therapy, such as those just mentioned by Dr. Leonard Williams, perhaps might have been obviated had a suitable combination been substituted for the single extract. Several French observers, notably Renon and Delille, had recorded their belief in the advantages of this procedure. This opened up a most complicated but nevertheless promising field for therapeutic application, and suggested that possibly, in future, pluriglandular therapy might be much more frequently resorted to with increasingly encouraging results.

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[1] *La Presse Méd.*, Par., 1913, xxi, p. 880.

The PRESIDENT (Dr. W. S. A. Griffith) said that he was sure that he was expressing the wishes of the Section in offering a cordial vote of thanks to Dr. Blair Bell for his able and interesting paper, and to Miss McIlroy for her contribution to the discussion. Especially would he also thank Dr. Marshall, the Lecturer on Agricultural Physiology at Cambridge, and the author of that well-known book "The Physiology of Reproduction," who had been so good as to come and take part in the discussion. To Mr. James Berry, whose work on the thyroid was so well known, and to the other visitors who by their contributions had added so much to the value of the discussion they also offered their hearty thanks.

Dr. Blair Bell was an enthusiastic investigator of this difficult subject and had recently received from the Royal College of Surgeons the Hunter Gold Medal for his researches, a highly valued appreciation in which all joined in congratulating him.

Dr. Griffith asked Dr. Blair Bell in replying to state what he implied by the terms, "excess and diminution of secretion of the ovaries," and what evidence there was of the conditions (apart from removal of the ovaries) in which either diminution or excess of ovarian secretion occurred. It appeared to him that in the human ovary, though we knew a good deal about the various diseases, we were in ignorance of the variations in their internal secretion which might accompany them.

Dr. BLAIR BELL, in reply, said that the discussion had been of exceptional interest, and he felt that the Section was greatly indebted to the guests, who had been invited to take part, for their extremely valuable contributions. It was impossible adequately to reply to all the criticisms made and points raised, but he would endeavour to deal with some of the more important.

He could not admit that removal of the ovaries in young animals produced a persistence of infantile characteristics in regard to the soma, as stated by Miss McIlroy. Surely it was well established that there was an increase in the growth of bone in young animals after experimental removal of the ovaries. Further, Miss McIlroy said she did not consider it possible to gauge degrees of femininity in women. In reply, Dr. Blair Bell said he could only suppose that women, ever modest, might themselves fail to recognize their greatest asset; but he felt sure that every normal man was acutely alive to the differences in this respect to be found in different women.

With regard to the criticisms made by Miss McIlroy and Dr. Elliott as to the value of urinary analyses in the estimation of the calcium metabolism, and the suggestion that it was much more accurate to estimate and compare the total quantity of calcium taken in and the total output in the fæces and urine, he thought there was a certain fallacy in the latter method which was not generally recognized. It was, of course, possible by such a procedure to learn how much calcium was retained, if a loss were found in the excretions. But so far as the intestine was concerned it was impossible to find out how much was absorbed, how much was excreted, and how much passed directly through. It had to be remembered, also, that the breaking down and excretion of an unknown quantity of stored calcium, such as occurred in osteomalacia, must confuse the results of experiments carried out in the manner suggested. He ventured to think, therefore, that a urinary analysis gave as true an index of the metabolism in regard to calcium as the method suggested ; this was especially so if the urinary analysis were combined with a blood analysis.

He had been greatly disappointed with the trend of Dr. Elliott's remarks ; and he could neither agree with him that our knowledge of the subject was a complete blank, as he seemed to imply, nor that the work of clinicians was necessarily unreliable. He believed that future advancement in this subject would come from those who could correlate laboratory and clinical observations. It was the combined laboratory-ward system that gave Germany and America the great advantage they possessed over this country in respect to scientific investigation and achievement. By way of trying to show that the work of Dr. Blair Bell and all other experimenters was unreliable in regard to those results which went to prove that death inevitably followed complete removal of all suprarenal tissue, Dr. Elliott had mentioned the case of a cat which was *still* alive and well some time after he had removed both suprarenals. Dr. Blair Bell considered that the record of this experiment by Dr. Elliott was in itself an illustration of the unreliability in the conduct of experimental work against which Dr. Elliott had spoken so strongly. It was also an instance of the danger of drawing a conclusion from an incomplete experiment. In all probability the animal in question had accessory suprarenals—either complete or represented by chromophile bodies (accessory medulla). These accessory suprarenals, complete or partial, were common in most animals—indeed in some mammals, such as the rat, the main suprarenals could often be removed with impunity so far as life was concerned. This, however, was not usually the case in regard to cats. Consequently such a case as that mentioned should never have been brought forward as evidence against the experiments of others until a complete post-mortem examination had been made by a competent observer. Mr. Berry and others had answered Dr. Elliott's adverse criticism concerning the frequency of exophthalmic goitre in connexion with ovarian insufficiency.

Exception had been taken by the President and Dr. Leonard Williams to the use of the terms "insufficiency" and "excess" in regard to the secretions of the ovary and other endocrinous glands. Dr. Blair Bell was unable to follow their arguments, as it appeared to him that if an organ were removed there must be insufficiency of its secretion, and conversely in the case of hyperplasia, which produces—at any rate in the case of the thyroid—the same symptoms as an overdose of the prepared extract, there must be excess.

With regard to the view expressed that the pituitary body was one organ, which was criticized by Dr. Leonard Williams, it was not Dr. Blair Bell's intention to convey the impression that the extract of the anterior lobe had the same physiological pressor action as the posterior. It was well known that the extract of the anterior lobe had no such action. Infundibulin was probably produced, however, by differentiated or altered cells of the pars intermedia which came into relation with the pars nervosa. These cells were of the same origin as those of the pars anterior. He was quite unable in the light of our present knowledge to recognize any scientific basis for Dr. Leonard Williams's belief in a multiplicity of secretions by identical cells. It appeared to Dr. Blair Bell that Dr. Leonard Williams had confused multiplicity of function and effect with multiplicity of secretion. Surely one secretion could produce many effects.

He did not think that the case mentioned by Dr. Routh, which apparently was one of male pseudo-hermaphroditism, invalidated the statement that ovarian hyperplasia and tumours alone produced sexual precocity in girls, as he understood Dr. Routh to say.

In conclusion, Dr. Blair Bell thought that in spite of the great difficulty of the subject, and in spite of the scepticism of many about results which did not coincide with their own, there were now definite and acknowledged facts which, taken together, showed that the question of the correlations of the internal secretions had long passed beyond mere theory. And he was sure none could deny, in regard to the subject under discussion, that the treatment of many previously obscure disorders had been materially assisted by the work already accomplished.

Obstetrical and Gynæcological Section.

December 4, 1913.

Dr. W. S. A. Griffith, President of the Section, in the Chair.

Obliteration of Upper Portion of Vagina, probably the Result of Total Hysterectomy.

By Alban Doran, F.R.C.S.

This preparation was dissected out of a pelvis belonging to a subject in the Operative Surgery Class at the Medical School of the London Hospital. The pelvis was brought to the Museum of the College of Surgeons by Professor A. Keith in 1908, when he was appointed Conservator. The pelvis was given over to the Prosector, Mr. William Pearson, in order that he might make preparations illustrating the anatomy of the sacro-iliac synchondrosis and the symphysis pubis. Professor Keith informs me that the parts here displayed represent all the soft structures that remained in the pelvis when it was taken to Museum. They were removed from their bony attachments and carefully dissected. There is a female bladder, perfectly normal, with the lower part of the vagina, 1½ in. deep, and completely occluded above, where there is apparently a small transverse cicatrix. The rugæ are well marked on the mucosa anteriorly. The urethra and ureters show no abnormalities.

Unfortunately no history can be traced. The vagina is clearly occluded, and it evidently functioned, although it has been dilated by a plug of wool so that its interior may be the better displayed. Is the occlusion congenital or is it the result of a total hysterectomy? On the whole it would appear most probable that the latter supposition is correct. No doubt a vagina occluded in its upper or middle portion through arrested development may become dilated and the deformity may never be detected unless the subject be examined on account of the sterility which necessarily accompanies that condition. The vulva and perineal structures being cut away, it is not possible to be certain that the patient had borne children. The vagina here displayed, however, shows the high development usually seen in multiparous women. Hence its vault was probably severed from its lower portion together with the uterus in an operation for the removal of a fibromyomatous or other non-malignant tumour in the upper part of the genital tract. I admit, however, that I am not quite convinced and I should like to hear the opinion of the Section. The specimen will be preserved in the Museum of the College.

Case of Primary Cancer of Bartholin's Gland.

By Herbert R. Spencer, M.D.

E. H., aged 43, who had had a child twenty years ago, but no miscarriage, was sent into University College Hospital as a case of inflamed Bartholin's gland on February 13, 1912. She complained of a lump and a dull aching pain in the vulva which had been present for seven months. Pain on coitus also occurred seven months ago and became so severe that for some months past coitus had not occurred. In the last two or three months she had also had occasionally a dull aching pain in the groin, and the vulvar pain had extended to the coccyx and was rendered more severe by walking. Menstruation began at the age of 13, and had always been regular (three to four weeks) and usually rather painful. At the last two or three periods the pain had been so severe that the patient was confined to bed. Her mother had died of cancer.

The patient was rather fat and anæmic; nothing abnormal was detected in the chest or abdomen or in the urine. The vulva was rather red and a slight swelling (*see* fig. 1) was seen on the left side beneath the hinder part of the left labium minus; it was as big as a marble, only slightly prominent, but could be easily felt by the fingers and thumb. The skin over it had a bluish tinge, but was otherwise healthy and moved over the tumour. The remains of the hymen on the left side were œdematous and the orifice of Bartholin's duct was visible; on the right side it could not be seen nor the gland felt. The tumour was hard, much harder than an inflamed Bartholin's gland, and its surface felt slightly irregular, especially when palpated through the thin mucous membrane covering its inner aspect. The tumour was movable on the subjacent structures, but was tender to the touch. An enlarged gland was felt in each groin. The cervix was very large and the lips thickened, and from it escaped a little muco-purulent discharge, which contained staphylococci and *Bacillus vaginæ*, but no gonococci. The patient herself stated that she had never suffered from any discharge. Nothing abnormal was detected in the body of the uterus.

The tumour in the vulva was diagnosed as a primary cancer of Bartholin's gland, and was removed on March 3, 1912, by pulling it up with thumb and fingers, and freely excising the lump at about ½ in. beyond the growth. The superficial inguinal glands were removed by separate incisions from each groin. The wounds were stitched up with silkworm gut and healed by first intention, except the hole in the centre of the vulvar wound, where a rubber tube was placed. This had also healed by March 12. For two or three weeks after the operation shooting pains were felt in the wound, and some induration was palpable

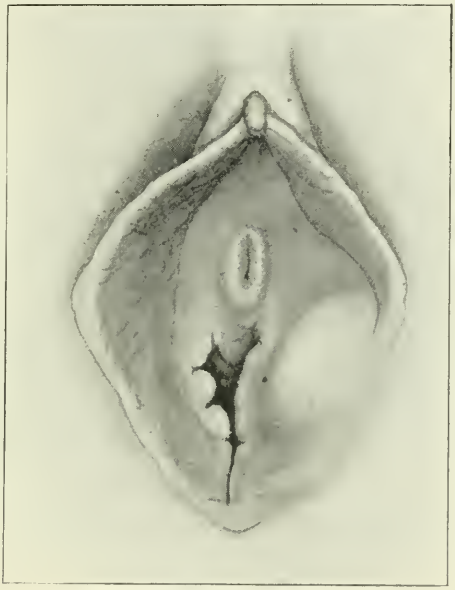

Fig. 1.

Showing the tumour (rather too prominent), œdema of the hymen, the orifice of left duct, and absence of orifice on right side. (From a sketch by author just before operation.)

there, but these gradually subsided. The patient was examined on July 2, 1912, and on October 21, 1913,[1] when she was quite well, and free from pain; the scars were sound and the tissues beneath them soft. The lump removed measured, after hardening, 4·5 by 4 by 2·8 cm. and consisted of the growth with the covering skin (labium majus, labium minus, hymen and portion of vagina) and about 1 cm. of the tissues deep to the growth; on incising it in the fresh state from the deep surface it had the appearance of a scirrhus.

The excised mass containing the tumour was hardened in formalin-salt solution, and after a few weeks a slab ¼ in. wide was cut through it transversely so as to include the orifice and duct of the gland. Serial sections were then cut until the duct was reached. One of these fortunately cut through the whole of the duct and the growth (*see* figs. 2 and 3). An examination of this section shows that the growth is a carcinoma arising in the gland, the main duct being free from growth and being lined with several layers of stratified epithelium except at two spots of its deeper portions, where tall cylindrical cells are seen (fig. 4). The growth consists of masses of epithelial cells radiating irregularly from a centre which is occupied with cellular débris and blood. The largest epithelial masses are found at the periphery, especially towards the labium minus (*see* fig. 2). Many of

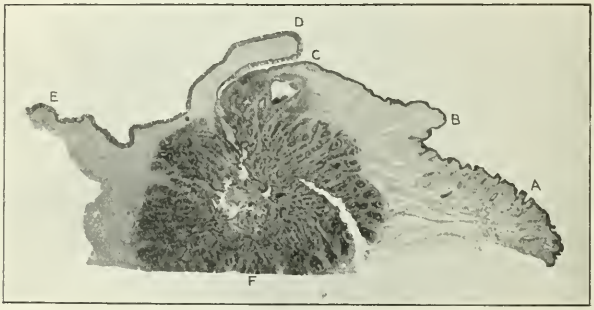

Fig. 2.

Photograph of microscopic section magnified 2 diameters. A piece has been cut off from the lower edge which has removed the deepest part of the growth and the subjacent tissue; the crack in the growth is due to an incision made in the fresh state. F, the cancer; C, the gland duct; D, the hymen; A, the labium majus; B, the labium minus; E, the vaginal wall.

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[1] The patient remained well and free from recurrence on January 13, 1914.

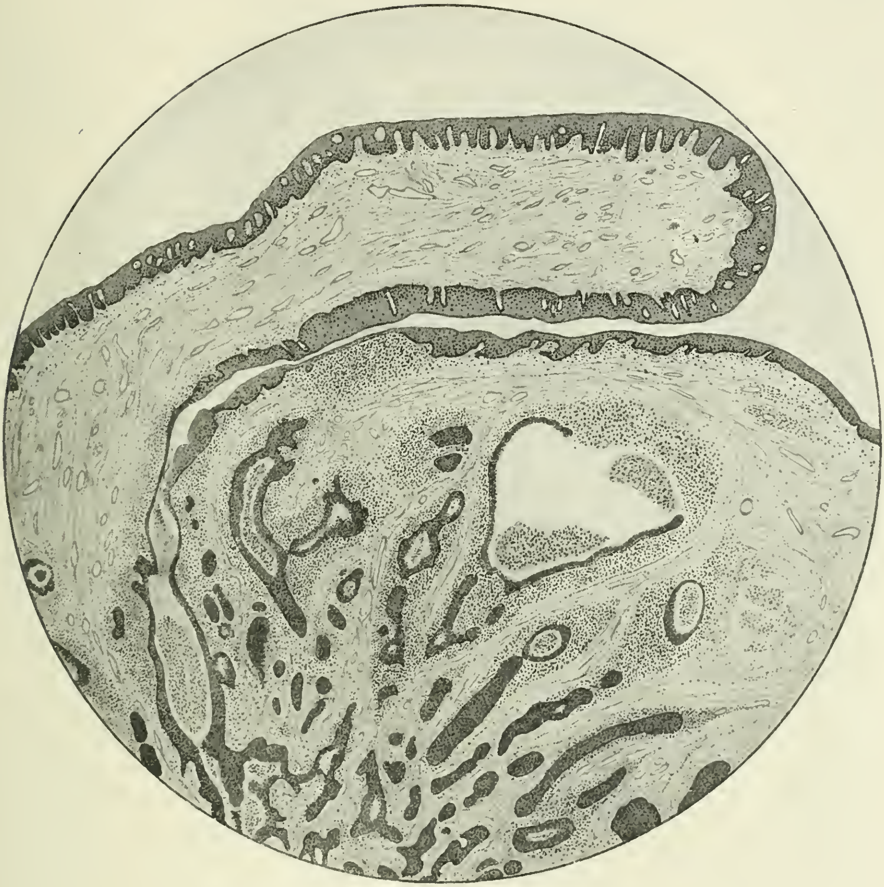

FIG. 3.

Microscopic section (a portion of fig. 2), magnified 13 diameters, showing the hymen, duct, and cancer, with well-marked round cell infiltration. The duct is not affected with cancer. At one part (2 in. from the edge of the hymen) the stratified epithelium is thin, probably desquamated as a result of a deposit of leucocytes beneath it; farther down the stratified epithelium is thicker, especially on the outer wall, from obliquity of the section; deeper still it becomes very thin from desquamation; at the bottom it merges with the cancer. The cancer masses are seen to be most developed at the periphery of the tumour; some are vacuolated owing to the degeneration of the central cells.

the cellular masses have broken down in the centre, leaving small cysts visible to the naked eye. There is abundant round cell infiltration.

The growth is probably a columnar cell carcinoma, although many parts of the growth have the appearance of squamous carcinoma and the cells have undergone keratinization. The growth in the excised inguinal glands also had the appearance of a squamous cell carcinoma.

The normal anatomy of Bartholin's gland has been described by Langerhans, de Sinéty, and Jambon and Chaboux.

De Sinéty,[1] after alluding to the irregular dissemination of the acini (separated by connective tissue and striped muscular fibres), says they are lined by a layer of caliciform epithelium closely resembling that of the cervix uteri. The lobules open by a narrow neck into an indifferent tissue ("des sortes de tissus") lined with cubical epithelium. From the sinuses pass the excretory tubes lined with a single layer of cylindrical epithelium. The common excretory duct presents several layers of cylindrical epithelium, which becomes squamous near its termination. In all its extent the duct receives little glands opening at various heights without the intermediary of secondary tissues or canals.

Jambon and Chaboux[2] examined glands of young adults (aged 20 to 25) twenty-four hours after death. They state that the excretory ducts appear in the middle of the gland in the form of irregular cavities reaching even to the middle of the acini. They present an epithelium either of one or several layers of cubical cells. Generally, as the duct increases in calibre and importance its epithelial lining becomes thicker. The cells are only half the size of the secretory cells of the acini and consist of a large nucleus surrounded by a thin layer of granular protoplasm: near the termination of the common duct the superficial layers of the lining epithelium tend to become squamous. The gland is surrounded by a kind of capsule of connective tissue, and there are no striped muscular fibres in the gland itself. There are some involuntary muscular fibres only around the larger excretory ducts. These authors say nothing about distinctly cylindrical epithelium in the duct, though this is mentioned by de Sinéty,[3] Klein,[4] and Langerhans.[5]

J. Thomas[6] has also written a valuable monograph on the excretory

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[1] *Comptes-Rend. et Mém. Soc. du Biol.*, Par., 1880, 7 sér., ii, p. 280.

[2] *Lyon Méd.*, 1906, cvii, p. 3.

[3] *Comptes-Rend. et Mém. Soc. du Biol.*, Par., 1880, 7 sér., ii, p. 281.

[4] Stricker, "Handbuch der Lehre von den Geweben," Leipz., 1871-72, p. 648.

[5] *Virchow's Archiv*, Berl., 1874, lxi, p. 208.

[6] Inaugural Dissertation, Göttingen, 1905.

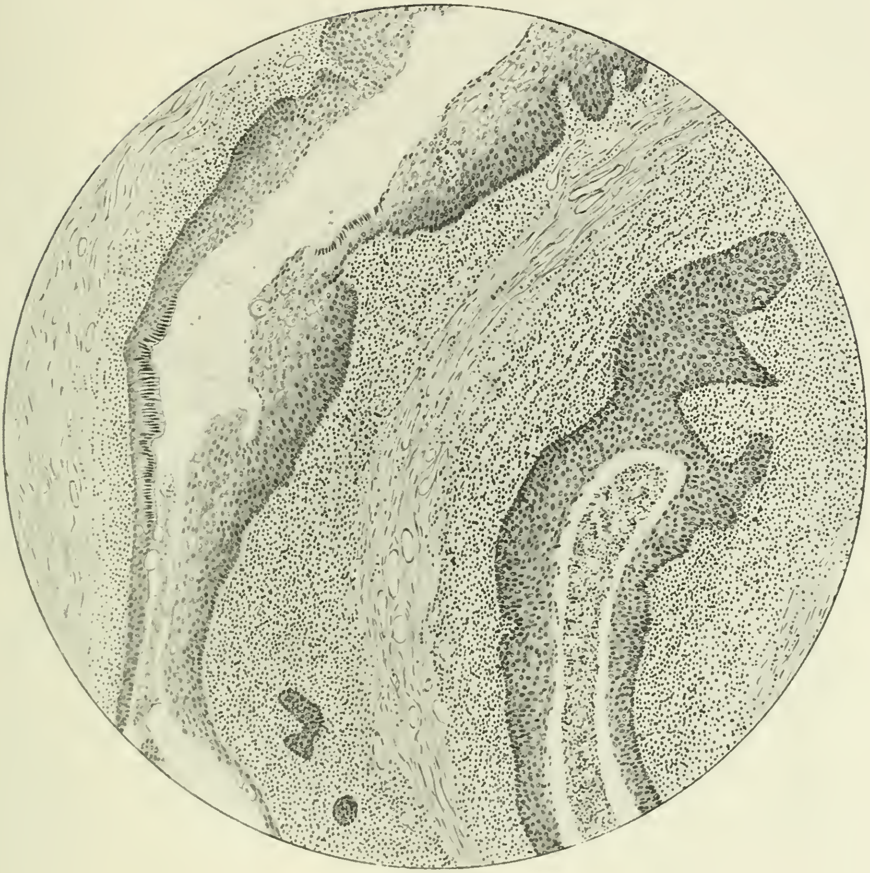

Fig. 4.

Microscopic section (a portion of fig. 3), magnified 56 diameters, showing deeper part of duct, and one large and two small masses of cancer. The inner (left) wall of this part of the duct is lined above with stratified epithelium, below the middle with well-marked columnar epithelium, and at the bottom with one or two layers of cuboidal epithelium; the outer (right) wall is lined above with stratified epithelium, then for a small distance by columnar epithelium, and below again by stratified epithelium, which appears thick owing to obliquity of the section; the cells are vacuolated and have desquamated below. A large mass of cancer is seen on the right of the section, with columnar or cuboidal peripheral cells and degenerated central cells lying in a cavity. Two smaller masses of cancer are also seen, and marked round cell infiltration.

duct, glandular ducts and acini of Bartholin's gland and their epithelium. Perhaps the peculiar character of the epithelium may account for the different views of various authors upon the name which should be given to the carcinoma arising from it (*see* table).

REMARKS.

The case reported is one of primary carcinoma of Bartholin's gland. That the growth has originated in the gland and not in the duct is shown both by the normal structure of the main duct and the presence in it of columnar epithelium and by the fact that the most advanced growth is in the peripheral parts of the acini (*see* fig. 2). That it is an adeno-carcinoma is indicated also by its acinal arrangement and by the columnar or cuboidal cells found at the base-line of some of the cellular masses. The resemblance to squamous cell carcinoma is due to degenerative changes in the cells such as are often met with in adeno-carcinoma of the uterus. These degenerative changes have led to the cavitation of some of the peripheral masses, and it is the enlargement and bursting of these cavities which lead to the sinuses and discharging cavities which have been met with in the more advanced growths.

Primary carcinoma of Bartholin's gland is a very rare disease. I have only been able to find records of thirteen cases, of which a table is appended.

Fritsch's case (quoted by Honan) I have not included in the table: the author gives no particulars; he only states[1]: "Such cases (cancer of Bartholin's gland) are very rare. I have only operated once; the extirpation gives rise to no difficulties." The reports of the cases of Wolff,[2] Bogoslawsky,[3] Grosz[4] and Neumann[5] I have not been able to obtain. Many of the reports are incomplete.

The disease has occurred at ages between 28 and 91. Half of the cases were over 50 years of age and no fewer than four were 70 years old or over. It occurs with equal frequency on the two sides.

With regard to its causation, one naturally looks for a history of inflammation, and especially of gonorrhœa; in only one instance (Sitzenfrey's) is there a definite history of gonorrhœa; in Trotta's case there was a history of abundant discharge fifteen years previously, and in v. Frisch's case discharge for three years; in Honan's case a history of leucorrhœa; in Geist's case and in the case now reported there is a definite statement that no abnormal vaginal discharge had ever been noticed. But in the latter there were definite signs of cervical infection with staphylococci and *Bacillus vaginæ*, but not gonococci.

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[1] "Die Krankheiten der Frauen," 9te Aufl., 1900.

[2] *J. f. Geb. und Fr.* (Russian), 1890, p. 12.

[3] *Jurnal akusherstva i Zhenskikh Boliezneĭ*, September-October, 1905.

[4] Orvosi hetilap, iv, 1906.

[5] *Wiener med. Bl.*, 1888, xi, pp. 577, 612.

In Sitzenfrey's case there was inflammatory enlargement of the gland on the other side, which subsequently subsided. It is of course possible that this gland became secondarily infected by the discharge from the cancerous gland.

With regard to its possible origin in a congenital abnormality of the gland, in Sinn's case there was no gland on the other side, as decided after careful post-mortem examination, and in my case there was no orifice and no gland could be felt on the right side.

Cancer of Bartholin's gland appears first as a small, hard, tender lump which is accompanied by severe pain of an aching or lancinating character, sometimes passing to the coccyx and groin and being greatly increased by walking, during menstruation, and by coitus. The skin over it may be bluish and the remains of the hymen œdematous. On examination the lump is much harder than an inflamed or cystic gland, and on careful manipulation its surface feels slightly nodular, a feature best made out through the thin skin of the labium minus or vagina. After a time the growth becomes apparent to the sight and bursts through the skin by one or more orifices, which in some cases are the broken-down centres of the cancerous masses and in others the duct distended or ulcerated by growth. The tumour may then become papillary or irregular on the surface and may be fixed to the bone of the pubic arch. The inguinal glands are early affected.

Like cancer in other parts of the vulva, it is of great malignancy; in only one case (Trotta's) is there a history of freedom from recurrence for a considerable period (six years). In that case the inguinal glands were not removed. The great malignancy of the growth renders early diagnosis imperative. The case now published is one of the earliest and one of the few cases in which diagnosis has been made before operation. It is in the hope that this short account of a rare disease may tend to facilitate the diagnosis that I publish this case, although a sufficient time has not elapsed to ascertain whether the patient is cured.

TABLE.

PRIMARY CANCER OF BARTHOLIN'S GLAND.

Author	Age	Children	Abortions	Tumour	Glands	Operation	After-history
A. Martin: "Diseases of Women," 2nd ed.	70	—	—	—	Affected; removed	Removal	Recurrence after four years
W. Sinn: Inaugural Dissertation, Marburg, 1880	28	—	—	Left side, size of hen's egg; on section shows brown pigment; duct 7 mm. long; "*melano-carcinoma*"	Not enlarged	Post-mortem specimen	—
Geist: Inaugural Dissertation, Halle, 1887	59	4	—	Right side, size of fist; mucous membrane normal, duct 2 cm. long; menopause at the age of 51; part of tumour resembled *tubular cancer*, part *scirrhus*	Not enlarged; not removed	Removal by knife	—
Schweizer: *Arch. f. Gyn.*, 1893, xliv, p. 322	58	—	—	Right side, size of pigeon's egg: dilated duct open for 1 cm.; skin normal; diagnosed as inflammatory. After three years, size of hen's egg, adherent to skin and bone; duct admitted finger; bled on examination; *carcinoma parvicellulare*	—	Refused operation	—
Mackenrodt: *Zeitschr. f. Gyn.*, 1893, xxvi, p. 186	54	—	—	Left side, size of fist; severe pain for three months; duct eroded and occupied by cancer	Not removed (Honan)	Removal	Normal scar after four months
J. H. Honan: Inaugural Dissertation, Berlin, 1897	40	—	—	Right side; two years ago a small nodule noticed, which disappeared; pain spontaneous and during coitus, and wasting for a year; size of prune; hard, not fluctuating, but slightly tender; skin normal; *carcinoma*	Not enlarged; not removed	Removal	A year later recurrence in left inguinal region; malignant glands removed; well two months later
Godart: *Bull. de la Soc. Belge de Gyn.*, 1899, ix, p. 1898	45	—	—	Left side; for two years—i.e., since menopause—pain in left labium majus and a hard tumour, regular on surface, slightly tender; size of pigeon's egg; *carcinoma*	—	—	—
Trotta: *Archivio di Ost. e Gin.*, 1900, vii, p. 193	30	2	—	Right side; swelling noticed and spontaneous lancinating pain, radiating to neighbouring parts; walking did not hurt her, but pressure and coitus caused pain; size of nut, hard, not fluctuating, surface not perfectly smooth; duct $1\frac{1}{2}$ cm.; *cancroid carcinoma*	Not enlarged; not removed	Removal by knife; suture; primary union	Quite well and free from recurrence after six years

R. Schäffer: *Zeitschr. f. Geb. u. Gyn.*, 1903, l, p. 193	73	—	—	Left side, size of hen's egg; mistaken four years before for abscess; *cylindrical carcinoma*	Not mentioned at first; later, size of pigeon's egg	Removal	Recurrence after two and a quarter years; alcohol injected into recurrent growth
W. N. Burghele: *Zeitschr. f. Gyn.*, 1903, l, p. 1102; (from *Rivista di Chir.*, 1902)	50	—	—	Size of nut with raised, irregular surface and many fistulæ discharging purulent fluid; *adeno-carcinoma*	Not swollen	Removal	Recurrence in one month; again removed
O. v. Frisch: *Monatschr. f. Geb. u. Gyn.*, 1904, xix, p. 60 Peham; *Zentralbl. f. Gyn.*, 1903, xxvii, p. 1506	77	8	—	Right side; mucous discharge for three years, then tumour noticed in vulva, at first small, then grew and interfered with walking; discharge became profuse and offensive; tumour size of nut, red (like granulations), covered with mucus which reappeared in drops when removed; firmish, lobulated, cauliflower-like, bleeding slightly on examination, not painful, movable; *villous carcinoma*	Enlarged; diminished after removal of tumour	Removal (Schleich local anæsthesia); primary union except a small spot	Patient had bronchitis, but recovered; later history not given
A. Sitzenfrey: *Zeitschr. f. Geb. u. Gyn.*, 1906, lviii, p. 363	29	—	—	Right side; swelling noticed in right labium for two years, in left labium for some weeks; both swellings very painful and discharged pus; right tumour size of hen's egg, only movable in labial part, elsewhere adherent; no ulceration, slight redness where adherent. On pressure "pus" exudes from several fine openings; orifice of duct red and beset with fine papillary excrescences; pus contains cocci and bacilli, but no gonococci. Treated as inflamed cyst; left swelling subsided; right tumour grew and was removed. *Squamous cell carcinoma*	Inguinal glands, not enlarged	Removal (v. Franqué) with thermo-cautery, part of levator ani also remained; cavity size of fist left; healed in a month	Recurrence six months later, adherent to ramus of pubes; removed July, 1904, with thermo-cautery together with periosteum; in October, 1905, patient had prolapse of vagina on right side and enterocele
Pape: *Deutsch. med. Wochenschr.*, 1907, xxxiii, p. 1620	91	—	—	A *cylindrical carcinoma*	Removed; not cancerous	Removal; union *per primam intentionem*	—
Herbert Spencer: (case now recorded)	43	1	0	Left side; pain and lump noticed seven months; size of marble; skin over it bluish; hymen œdematous, orifice of duct normal (no orifice on right side); surface of tumour slightly irregular; tender to touch, painful; *adeno-carcinoma*, resembling squamous carcinoma	Carcinomatous; removed at same time	Removal with knife after raising tumour by two fingers and thumb, March 3, 1912	Patient well and free from recurrence, January 13, 1914

Report of the Pathology Committee.—The Committee reported as follows: "We have examined the sections submitted, and are of opinion that the growth is a squamous carcinoma originating in the deepest part of the duct of Bartholin's gland. We are not satisfied that there is any positive evidence of its origin from the gland, as no traces of the gland acini can be seen in any of the sections."

"Dr. Spencer is of the opinion that the growth is an adeno-carcinoma, although it resembles squamous carcinoma microscopically. He bases this opinion on the normal structure of the outer part of the duct, on the total absence of the normal gland structure from the specimen, on the lobulated radiating structure of the growth, and its greatest development in the peripheral masses."

Dr. EDEN said that he had seen one case of this rare condition. The patient was a lady, aged 40, whom he had seen in consultation with a gynæcologist and a general surgeon. Eighteen months before this she had an abscess in the left labium which had discharged continuously ever since, and recently a hard lump had formed in the same region. This swelling lay deep in the posterior part of the left labium, passed upwards behind the posterior vaginal wall, and appeared to be attached to the margin of the pubic arch. The left inguinal glands were enlarged and indurated; in the right groin two or three small glands were palpable. An operation was decided upon and he saw no more of the patient for two months, when she returned, saying that she was afraid the growth had recurred. An operation had been performed, but the glands in the groin had not been removed. Beneath the cicatrix in the labium was a small nodular growth which lay in close contact with the bone, and the glands in the left groin were much larger. Another operation was performed, and this time a piece of the pubic arch was removed and the left groin cleared of all its glands and fat, and subsequently radium was used both for the labium and the groin. The growth was an adeno-carcinoma, and up to the present time, nearly three years after the second operation, no recurrence has taken place.

Twin Pregnancy; Hydatidiform Mole associated with Normal Ovum; Abortion at Four Months.

By GORDON LUKER, M.D.

THE patient, T. S., aged 30, was married and had three children, the youngest aged 8; one abortion five years previously. She was admitted to the London Hospital, under the care of Dr. Russell Andrews, when about three and a half months pregnant, complaining of bleeding on and off for two months. She had been seen at the out-patients' department a month previously, when a retroverted gravid uterus was found, the position corrected, and a ring inserted. On admission the general signs of pregnancy were present, the level of the fundus of the pregnant uterus being nearly up to the umbilicus. Internal ballottement was obtained. Expectant treatment was adopted. About ten days later severe hæmorrhage recurred and the cervix and vagina were plugged with gauze. This was followed by abortion of a hydatidiform mole, together with a normal fœtus and placenta of about four months' gestation. No enlargement of the ovaries could be detected by vaginal examination.

Description of specimen: Total weight, $1\frac{3}{4}$ lb. Fœtus, normal development, about four months. Length: Head to heel, 8 in.; to anus, 6 in. Cord: Twisting just started. External genitalia: Sex not obvious. Internal genitalia: Sex female. Placenta: Normal, size 5 in. by 4 in. Hydatidiform mole: Typical mass of vesicles embedded in blood-clot; volume about 4 oz. Sections: (1) Placenta, typical chorionic villi seen; (2) hydatidiform mole.

DISCUSSION.

Dr. AMAND ROUTH alluded to a case of hydatid mole with a surviving twin narrated by Depaul,[1] who says, "All the world knows that the celebrated Beclard was the result of a hydatidiform pregnancy." Depaul mentions this case as a reason for abstaining from active interference in the absence of serious symptoms.

The PRESIDENT (Dr. W. S. A. Griffith) remarked that this specimen, not a very rare one, supported the view that the cause of the cystic mole lay in the ovum and was not endometrial or maternal. If the cause was maternal it would be almost inconceivable that the other twin should develop normally.

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[1] Parvin's "Science and Art of Obstetrics," 1887, p. 280.

Case of Complete Inversion of a Prolapsed Uterus in a Patient aged 57.

By John D. Malcolm, F.R.C.S.Ed.

This specimen was removed from a woman, aged 57, the mother of four children, the youngest of whom was aged 21. Menstruation

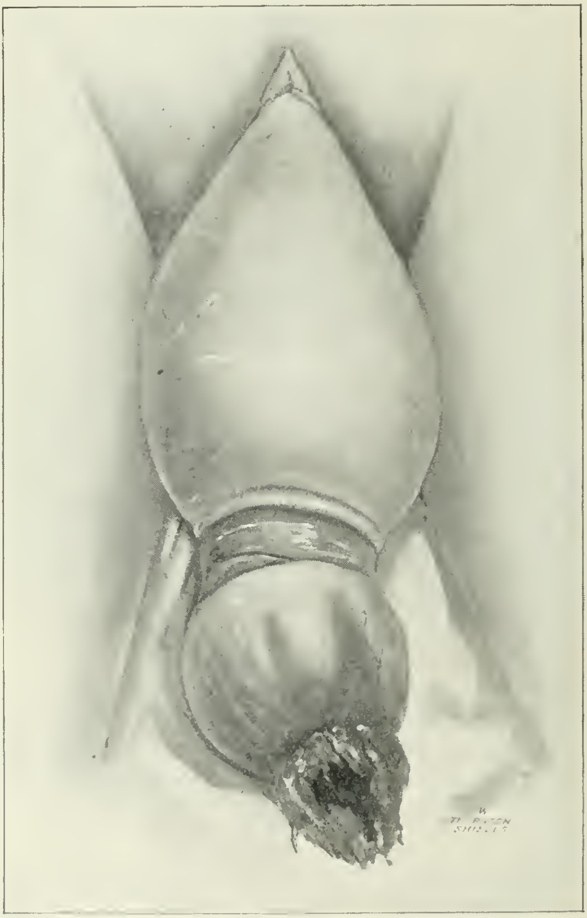

Fig. 1.

Sloughing fibroid causing partial inversion.

had ceased ten years earlier and the patient said her womb had been completely prolapsed for four and a half years; a pessary was worn two and a half years without much benefit. On October 25, 1913, the tumour first appeared at the mouth of the womb. On October 27 there was profuse hæmorrhage and the patient was admitted to the Samaritan Free Hospital on October 28. There was then a

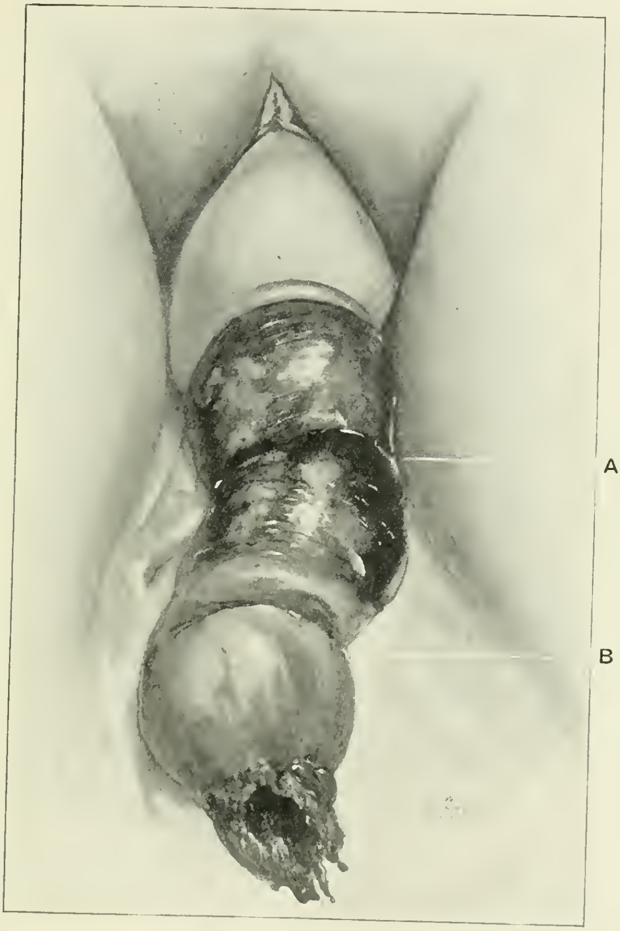

FIG. 2.

Complete inversion of uterus. A, line at which inversion was arrested on previous day; B, line of junction of sloughing fibroid and inverted fundus uteri.

dark-coloured tumour the size of a tangerine orange, with about half an inch of the fundus uteri projecting from the os uteri, as shown in fig. 1. The distal part of the tumour was ragged and sloughing and there was profuse hæmorrhage from its surface. The hollow in the top of the uterus characteristic of an inversion was felt both through the anterior vaginal wall and through the rectum. The pulse was 110, the temperature was not raised, and there had been no pain except a very little on micturition.

Hæmorrhage ceased twenty-four hours after the patient's admission to hospital and then the discharge rapidly became offensive. Early on October 30, the sister in charge of the case saw the parts as above described, but when I visited the hospital at 9.30, on the same day, the uterus had become completely inverted as in fig. 2. This shows a constriction where the inversion had been arrested the day before and the line where the fundus was joined firmly to the tumour. The whole surface of the uterus and tumour was in a sloughy condition.

As soon as the drawings were made the uterus was removed, the operation being a very simple one. The position of the bladder was identified and the parts were cut away by a circular incision close to the vagina. The peritoneum was picked up in a purse-string ligature, all bleeding points were secured and the parts were replaced in the pelvis and supported there by a gauze plug. The discharge at first was offensive, but otherwise convalescence was uncomplicated and the patient was discharged on November 14. She was advised to return later to have her perineum repaired.

I think it is not possible to say definitely why the changes described took place at the age of 57. Of course the uterus was much larger than it should have been at that age, and presumably as it was undergoing a slow involution the tumour, which had a wide base, was deprived of its blood supply, became gangrenous, and so set up sufficient irritation to cause its expulsion.

Mrs. SCHARLIEB said that a Hindu widow, virgin, aged about 60, presented herself at the Caste and Gosha Hospital for Women, Madras, complaining of inability to sit down. On examination there was, protruding from the vulva, a cylindrical object about 7 in. in length by 1½ in. in thickness. Attached to the extremity of this was a small fibroid, the size of a large chestnut. The woman being a virgin there was no question of inversion of the uterus due to childbirth. Apparently the fibroid had become engaged in the cervical canal and had set up contractions of the uterus which had resulted in inversion.

The woman said that this condition had existed for many years. The only possible treatment was by amputation of the mass, but unfortunately at the time there was no assistant able to give an anæsthetic and the operation was not feasible without one.

Chrobak's Instrument for Decapitation.

By G. G. Alderson, F.R.C.S.

This instrument was devised by the late Professor Chrobak, of Vienna, as a means of passing a Gigli's wire saw or whipcord round the neck of a fœtus in cases of transverse presentation requiring decapitation. It consists of a hollow tube curved at the distal end, through which passes a flexible wire mounted on a metal rod. The instrument is passed over the child's neck and the flexible wire pushed through until, guided by the palm of the left hand, it appears at the vulva. After threading a wire saw to the end, the flexible wire is withdrawn into the tube and the instrument drawn out, bringing the wire saw with it. It has been suggested the Gigli saw may cut the vaginal walls, but if while sawing the ends of the wire saw are crossed at the vulva there seems to be no danger at all of this occurring. Its chief advantage is the extreme rapidity with which it enables decapitation to be performed. Everything can be done in a few minutes without any damage to the mother. Without appreciably lengthening the operation the sawing can be performed obliquely from the neck to the opposite axilla so as to leave an arm attached to the neck, thus allowing of easier extraction of the detached head.

Dr. Drummond Maxwell thought the apparatus a very clever one, but at the same time of limited use. Very few obstetricians nowadays had a large experience of "decapitation," and it did not seem with the improved modern teaching of the student that a wide experience would ever be gained by an individual. For his own part, he had only performed the operation three times. In two of the cases there was not the slightest difficulty in applying the sharp hook round the neck and accomplishing its section. The other case was more difficult: the neck lay at a much higher level; the lower uterine segment was thin and he felt that too large a volume of the hand to reach the neck was introduced into the lower uterine segment compatible with its security. In such a case he felt that there was some room for this instrument. It could be applied safely round the neck without undue stretching of the lower uterine segment; but could one make traction on the Gigli saw round a neck at a high level, even if the strings were crossed, and at the same time guarantee that no portion of the saw would touch the vaginal mucosa or cervix? Dr. Maxwell thought this was expecting too much—he would go so far as to say it was impossible. If he met a similar case again where the neck lay at an excessively high level, he would adopt the procedure (which he believed was strongly recommended by Dr. Herbert Spencer) of dividing the child's trunk and spine with stout scissors after evisceration, and then proceed to deliver the lower half of the trunk and lower extremities before dealing with the cephalo-thoracic portion of the child, which might or might not then still require decapitation, but under vastly easier circumstances.

A Case of "Pre-eclampsia" at the Twenty-fourth Week; Acute Toxæmia; Cæsarean Section.

By Victor Bonney, M.S.

The following case illustrates a widening of the scope of Cæsarean section as a means of coping with certain cases of acute pregnancy intoxication while still in the pre-eclamptic stage.

The patient was a young lady pregnant with her first child and under the supervision of Dr. Beauchamp. Up to the twenty-fourth week she had been remarkably well. She then went to Buckinghamshire, and soon after arriving there was suddenly seized with vomiting and diarrhœa. Dr. Pocock, of Beaconsfield, who was called in, examined a specimen of her urine and found it to contain a very large quantity of albumin, together with a certain amount of blood. It is important to note that Dr. Beauchamp had examined the urine ten days previously and it was then normal.

The orthodox medical treatment for pregnancy albuminuria was at once resorted to, but in spite of it the patient was by next day much worse. The urine contained a good deal of blood and enough albumin to solidify on boiling, and the quantity passed *per diem* was much reduced. Moreover, the vomiting was incessant and she could not see clearly. Dr. Beauchamp and Dr. Pocock met in consultation and it was decided to bring her up to town as soon as possible. On the next day she arrived and I was asked to see her. There was some general œdema and well-marked jaundice was present. During the previous twenty-four hours she had only passed 12 oz. of urine and a specimen showed a large quantity of blood and enough albumin to solidify on boiling.

The pulse tension was very high and her sight was now so much impaired that she could only dimly distinguish the figures of those around her.

On examination I found the uterus the size of a twenty-four weeks' pregnancy, the cervix long and the os closed. We decided that in so acute a case of pregnancy intoxication evacuation of the uterus was the only course. Induction of premature labour either by bougies and Champetier's bag, or by dilatation of the cervix with Hegar's dilators followed by Champetier's bag, was considered, but all of us agreed that it was fraught with the risk of an eclamptic seizure taking place before the child could be delivered. The alternative of immediate emptying of the uterus by operative means was all, therefore, that remained. Of the two methods of performing this, abdominal and vaginal Cæsarean section, the former was decided on as being cleaner, quicker, and having the least risk.

I carried out the operation, assisted by Dr. Beauchamp and Dr. Pocock. It was, of course, very easy and only took sixteen minutes to perform. The placenta was situated anteriorly, and it and the child were removed together. The latter showed no signs of life, though the fœtal heart had been heard shortly before the operation. The uterus retracted well and the wounds in it and the parietes were closed in the usual way. An extraordinarily rapid improvement in the patient's condition followed. By next day the jaundice and œdema had disappeared, the vomiting had ceased, 25½ oz. of urine were passed containing a much reduced amount of albumin and no blood, and the eyesight was in large measure restored.

On the following day the improvement was continued and over 44 oz. of urine were passed, containing merely a trace of albumin. On the day after this the amount of urine was 66 oz. and the albumin had practically disappeared. From thence onwards convalescence was uninterrupted; she got out of bed on the fourteenth day and left the home at the end of three weeks.

As far as I am aware this is the first time that abdominal delivery has been resorted to in a case of pre-eclampsia before viability. Even as applied to patients in whom eclamptic convulsions are already present, the general attitude towards Cæsarean section has been one of grudging acquiescence as a last resort in desperate cases, and custom and current teaching have up to now been against its performance where the child is not viable. I hold, however, that in severe pregnancy intoxication the ovum should be regarded as an acutely malignant neoplasm, the immediate removal of which, before it has inflicted fatal injury on its possessor, is as logical and strongly indicated as is the resort to surgery in acute appendicitis, perforated intestinal ulcer, torsion of an ovarian cyst, or any other abdominal catastrophe. Where such removal can be most quickly effected by abdominal section, and where the skill and means requisite for the performance of the operation are at hand, I believe it to be the treatment of election, not only in eclampsia, but also in those cases in which, though no fits have occurred, they may be expected at any moment.

DISCUSSION.

Dr. EDEN said that he had once been jointly responsible for performing Cæsarean section on a case in which eclampsia appeared to be imminent. The patient was a lady, aged 40, who had had three previous pregnancies and was then at the fourteenth week of her fourth. For several weeks she had been treated for albuminuria, under the care of his colleague, Dr. Arthur Stabb. At first she improved, but during the last few days there had been a marked increase in the amount of albumin, without, however, any diminution of urea, or of the total urinary excretion. On the day before he saw her she had been seized with epigastric pain, nausea and vomiting, and during the night frontal headache and almost complete amblyopia set in. When he saw her the eyelids were puffy, she was drowsy, and the pulse-rate was 110, without any rise of temperature. Dr. Stabb and he agreed that it was their duty to put an end to the pregnancy by the most rapid method they could apply, and Cæsarean section was accordingly performed within an hour or two of this decision being arrived at. The mother and child both survived; no fits occurred at all, and there was marked improvement in the patient's condition within twenty-four hours. When profound toxæmia had declared itself, as in this case, he saw no reason for waiting until convulsions had set in before resorting to evacuation of the uterus.

Dr. AMAND ROUTH considered that Mr. Bonney's treatment was correct for his case and for all such cases of acute toxæmia approaching a crisis. In less acute cases he thought induction of labour would be preferable. He doubted whether "Cæsarean section" was a correct terminology for removing a fœtus before viability from the uterus by abdominal hysterotomy. Similarly he would not consider the removal of a uterus, with a three months' pregnancy complicated by fibroids, a Cæsarean hysterectomy.

Dr. DRUMMOND MAXWELL was very interested in the case recorded by Mr. Victor Bonney, and thought that a recent case of pre-eclampsia that he had seen at the London Hospital supported many of Mr. Bonney's views. The patient was a young primigravida, aged under 20, admitted to the hospital in her thirty-fifth week of pregnancy. Under observation, a reduced protein diet and eliminative treatment, the toxæmia had in no degree lessened. The condition had undergone a change for the worse in the last twenty-four hours. The mental condition was stuporous, the patient was mildly delirious ; amaurosis was not present to any marked extent (finger-counting test). A marked general œdema had set in during the last forty-eight hours ; there was the severest œdema of the vulva. The urine was scanty (10 oz. in twenty-four hours). Diacetic and acetone reaction was readily obtained in the specimen of urine. The patient was obviously on the verge of an eclamptic seizure. There were no signs of labour. The fœtus was alive. Cæsarean section was performed as soon as possible, for the œdema of the lower genital tract negatived, in Dr. Maxwell's opinion, any manipulative treatment from below, quite apart from the fact that methods adopted to induce labour would probably not effect their end till at least another twenty-four hours had elapsed. A 5½-lb. living child was delivered and the uterus allowed to bleed as freely as possible during its suture. The general œdema contra-indicated the introduction of more than a pint of normal saline solution into the veins. The patient made a very temporary recovery from the anæsthesia, but within the next twelve hours several fits occurred, she became deeply comatose and died in less than twenty-four hours after the Cæsarean section. It was important to emphasize the fact that no fits had occurred before the Cæsarean section, but he felt strongly that the onset of the subsequent fits and fatal coma proved the wisdom of the course that was adopted—namely, a surgical delivery. Post mortem the typical hepatic lesions of eclampsia were demonstrated.

A Case of "Cæsarean Myomectomy"; Remarks on the Operation.

By Victor Bonney, M.S.

. I desire to record the following case before the Section, because I am not aware that the operation I am about to describe has been published before.

The patient was but little over 30 years of age, pregnant with her first child. She had been sent over from India with a diagnosis of fibroids of the uterus, complicated by pregnancy. The tumours were said to be rapidly growing, and hysterectomy was suggested. I did not see her until she was five months pregnant, and though I found the uterus very abnormally large (the size of eight months' pregnancy), yet I could only feel distinctly a couple of small subperitoneal tumours. As she was very well in spite of the abdominal enlargement, I advised waiting. She went to term without any great degree of discomfort. Although I examined her many times, I could never succeed in definitely feeling any other tumours than the two I have mentioned. The lower pole of the child, however, remained persistently above the brim, and I therefore determined to perform Cæsarean section, a course further indicated because the fœtal head lay uppermost. On removing the child and eventrating the uterus, I found the latter greatly enlarged by multiple fibroids, the largest of which, the size of a melon, was deeply embedded in the uterine wall.

The patient and her husband were very anxious to avoid removal of the uterus, and therefore, after suturing the uterine incision in the usual way, I proceeded to enucleate the tumours. They were six in number, and the largest of them was submucous in position and had undergone cystic degeneration, being converted into a mass of grumous material, surrounded by a thin capsule. Three others, varying in size from a cricket ball to a golf ball, were interstitial in position, one of them being situated directly behind the uterus far down in the lower segment. The remaining two were subperitoneal in position, and sessile on the anterior uterine wall. There was a good deal of bleeding, but much less than might be expected, on account of the actively retractile state of the uterine muscle-fibres. In removing the largest tumour I again re-opened the uterine cavity, but I was able to obliterate by catgut sutures all the gaps left by the several enucleations.

The patient made an uninterrupted and rapid recovery.

I submit that the course I adopted in this case is a great advance on "Cæsarean hysterectomy," the operation usually adopted in such cases. When fibroids are complicated by pregnancy, the functional value of the uterus is proved and the organ is worth conserving. The strongly retractile state of the uterine wall is peculiarly favourable for enucleation, because it lessens the hæmorrhage from the cavities left after the removal of the tumours. This was markedly so in my case. Further, the mobility and pliability of the recently delivered uterus, by allowing its complete withdrawal from the abdomen, render access to and control over the wounds left by the enucleations much more easy than usual.

The operation is, of course, not to be performed unless it is certain that the uterine cavity is aseptic. For this reason, it will only be indicated in labour obstructed by fibroids, when the case is seen early, and before rupture of the membranes. Where, however, the occurrence of obstruction being foreseen, it is determined to remove the child by

Cæsarean section, I believe strongly that it should, in most cases, be considered the operation of election.

It may be asked, what will happen to the uterine scars if a patient again becomes pregnant? I believe that nothing will happen, if the operation be correctly performed—i.e., that the cavities left by the enucleation be entirely obliterated from their floor upwards by buried catgut sutures. I am aware that cases are on record where the scar of a previous Cæsarean operation has given way during a subsequent pregnancy or labour, but I believe that such weakness is due to faulty suturing, or weak union on account of sepsis. The extent to which a uterine scar will withstand the stress of childbearing has been revealed to me by the first patient on whom I performed utriculoplasty. Although in this woman a considerable portion of the uterus was removed, she has safely passed through three pregnancies; the first terminating naturally at seven months, the second terminating naturally at seven and a half months, and the third naturally at full term.

Syphilis in Relation to Uterine Disease.

By Beckwith Whitehouse, M.S.

The occurrence in the uterus of lesions the result of syphilitic infection has long been regarded as extremely rare. Apart from the occasional record of a primary chancre upon the portio vaginalis of the cervix uteri, or the suggestion that some slow-spreading and non-malignant ulceration in the same area may be of syphilitic origin, very little has been written upon the subject. It is significant that the few existing facts have always been concerned with the cervix. As regards the corpus uteri, no reference has been found by the writer in the literature to any affection directly attributed to the syphilitic virus. If it is true therefore that the corpus does possess a definite immunity to the *Spirochæta pallida*, it is surely a matter of considerable interest, especially as the relationship is so intimate in connexion with placental and fœtal syphilis. The fact requires confirmation, and with the advent of more exact methods of investigation and diagnosis, it appears advisable that the position as regards the relationship of syphilis to the uterus should be reconsidered. Such investigation must proceed along one or both of two lines of inquiry

—viz.: (1) The application of the Wassermann reaction to patients who present uterine lesions, the pathology of which is at present somewhat obscure; (2) attempts to demonstrate the *Spirochæta pallida* in the tissues or secretions of the uterus.

For some months I have been carrying out an investigation on these lines at the General Hospital, Birmingham, and it is with the results so far obtained that the present communication is concerned. At the same time I wish it to be understood that the paper is rather of the nature of a preliminary report, in order to invite suggestions, rather than to submit a completed series of observations, since any such investigation must inevitably occupy many months before a long and conclusive series of figures can be brought forward.

Fibrosis of the Uterus.

In a paper upon the causation of uterine hæmorrhage published in 1912, I suggested that the underlying pathological factor in some cases of chronic metritis and fibrosis uteri might be syphilis, and advised that the Wassermann test be applied to such patients.

In August, 1913, Miss McIlroy published the results of an investigation in Glasgow of 100 successive out-patients by the Wassermann reaction, and found that nearly 50 per cent. were positive. In the same paper she also observed that syphilis might have some relation to fibrosis uteri.

Since writing the communication to which I have referred, sixteen cases with a clinical diagnosis of chronic metritis have come directly under my notice, and the blood of each of these patients has been tested by the Wassermann reaction at the Lister Institute of Preventive Medicine. Only one of the patients furnished a history of syphilitic infection, and until the report of the Wassermann test was received there was no reason to suspect any syphilitic lesion. In fact, all the patients but one denied most strongly ever having contracted the disease or of having exhibited symptoms suggestive of the same. Nevertheless, seven of the cases gave a well-marked positive reaction. These patients all applied for treatment on account of pelvic pain, irregular and profuse uterine hæmorrhage, and watery or muco-purulent discharge. The physical signs obtained on bimanual examination were those usually regarded as characteristic of chronic metritis, or fibrosis uteri—viz., a uterus slightly and uniformly enlarged, firm in consistence and tender upon palpation. The uterine adnexa were healthy. In three cases the hæmorrhage was so profuse in spite of previous curetting and intra-uterine application of iodine, nitric acid, &c., that it was necessary to remove the organ. In two of these cases, it is of interest to note that a Wassermann test was made and found positive after the hysterectomy was performed, and when the morbid anatomy of the specimen had been observed. In the third and last case the patient presented similar symptoms to the two preceding and a positive reaction was obtained before operation. A point of some importance, therefore, is the fact that in all three cases, where symptoms were so severe as to call for a radical operation, a positive reaction was noted.

The specimens which I bring before you all show different degrees of a condition with which we have been familiar for a long time—viz., fibrosis. In the most marked case the uterus measures 4¾ in. in length and weighs 11 oz. The anterior wall is 1½ in. in thickness, and shows a marked increase of fibrous tissue to the exclusion of the myomatous elements. The endometrium is not hypertrophic, but is very congested and hæmorrhagic. Microscopically the tissue shows extreme fibrosis with well-marked peri- and end-arteritis. Sections stained by Pappenheim's method show no plasma cells. A full description of the pathological appearances present in the specimens of these three cases, together with a brief résumé of the important clinical facts in the histories of the six cases giving positive reactions, is contained in the appendix to the paper.

In discussing these cases, the question naturally arises as to whether one is correct in attributing the lesion to syphilis, or whether it is merely a condition of different ætiology occurring in a syphilitic subject. Various factors have been suggested in turn as possible causes in the production of the fibrotic uterus. It is hardly necessary to mention such causes as repeated pregnancy, previous inflammation, &c. It is, in fact, sometimes said that fibrosis never occurs except in the uteri of parous women or in those of nulliparæ who have had previous uterine inflammation. As regards this statement, I have certainly seen one case in a nullipara, where there was no evidence to show that previous inflammation had existed. This case came under my notice several years ago, and I regret now that no Wassermann reaction was obtained, since at that time I never suspected syphilis as a possible cause of the lesion. Again, if inflammation is really the basis of most cases of chronic metritis, it is somewhat surprising that the infection does not spread more frequently to the appendages and peritoneum.

I shall be interested to hear the experience of others as to the incidence of inflammation of the appendages in association with fibrotic conditions of the uterus. Personally I have found the complication extremely rare. Also, in those cases that I have examined bacteriologically, about a dozen in all, the uterus has invariably been sterile, both by aerobic and anaerobic methods. This, of course, cannot be used as an argument against bacterial infection being the cause of the lesion, since the infecting agent may be long dead, as in the case of chronic pyosalpinx.

I have usually regarded fibrosis in the uterus as being a reparative process secondary to degeneration of the myomatous elements. This, especially in elderly women, is the result of arterio-sclerosis. However, in the light of the positive Wassermann reaction obtained in the cases I have recorded, it appears that this fibrosis is also at times associated with a syphilitic element. As Andrews observes, there are certain lesions of advanced syphilis which are intrinsically fibrotic from the beginning. Thus the pericellular hepatic cirrhosis and the indurative lung lesion known as "white hepatization" of syphilitic infants are both essentially a fibrosis. Again, in the acquired disease, interstitial myocarditis, orchitis, and the sclerosing forms of osteitis must all be placed in the same category, and all these bear a very close resemblance, both macroscopically and microscopically, to the disease which we describe as chronic metritis. Again, the vascular changes in the uterus in this condition also bear a striking resemblance to those seen in the vessels of organs undoubtedly syphilitic. At the same time it must be remembered that every obliterative endarteritis is not syphilitic. Tubercle, and in fact any chronic endarteritis, tends to obstruct the blood channels, and in the case of the uterus such changes undoubtedly occur as the result of pregnancy. However, in the case of the nullipara to which I have already referred, and where unfortunately no Wassermann reaction was performed, sections through the fibrosed uterus showed a well-marked obliterative endarteritis. It is highly probable, therefore, that those changes in the vessels of the uterus which we regard as more or less normal in the case of a parous woman provide a source of error by obscuring and covering similar changes which are the result of the syphilitic virus.

It is a matter of considerable interest that a true gumma does not occur in the corpus uteri. At the same time it must be remembered that both gummatous infiltration and fibrosis are essentially new formations of connective tissue. In the former the cells tend to early necrosis, whilst in the latter, as Andrews says, "the reaction achieves its goal." It is possible that the periodical congestion of the uterus prevents that local tissue death which is the essential process in a gumma and permits the organization of the young connective tissue cells to fully developed fibrous tissue.

The early lesions of syphilitic fibrosis of the uterus do not come under observation, because they do not give rise to symptoms calling for immediate treatment. The one symptom of the fibrotic uterus that calls for active measures is hæmorrhage. This is not produced until the contractile power of the organ is destroyed by extensive replacement of the uterine muscle by fibrous tissue and is therefore a late symptom.

The conclusive proof that uterine fibrosis is due in some cases to syphilis would be of course the demonstration within the tissues of the *Spirochæta pallida*. So far I have been unable to show the organism in sections stained by Giemsa's method. At the same time it must be remembered that it is only within the last few months that the organism has been found in the central nervous system in cases of tabes dorsalis and general paralysis of the insane. The relationship of both these diseases to syphilis has long been suspected, but the extreme difficulty in finding the specific organism has until recently obscured the pathology of the same. As Dr. Mott says, the term "parasyphilis" as applied to these two diseases must now be abolished. It is more than probable, therefore, that those purely fibrotic lesions which occur in the testis, heart, uterus, and other organs, are also directly due to the *Spirochæta pallida* and must not be regarded as parasyphilitic in nature. The failure to demonstrate the organism in the tissues is possibly due to the small number present, and in future I propose to employ smear preparations made from an emulsion of the tissues.

Before leaving the subject of syphilitic fibrosis of the uterus I may refer briefly to the value of the Wassermann reaction as a true test for syphilis. It will be remembered that of my sixteen cases of chronic metritis, seven gave positive reactions, and nine negative. In other words, on this very small basis, the positive cases form about 43·75 per cent. of the whole. According to Browning and Mackenzie, it may be said that 85 per cent. of cases in which there are *active* syphilitic lesions give a positive Wassermann reaction. A small proportion of cases, on the other hand, fail to give a positive reaction in spite of the presence of undoubted syphilis. The authors attribute this to the fact that the parasites are too restricted in their distribution to produce a positively reacting serum. Also, the question of latent syphilis must not be overlooked. During a latent period 50 per cent. only of cases give a positive reaction. Furthermore, as shown by Knöppelmacher and Lehndorff, 50 per cent. of the mothers of syphilitic children give a positive reaction some years after the birth of the last child, whereas a few months after parturition 90 per cent. of such women react positively. They are therefore, several years later, to be placed in the same category as latent syphilitics, and I am of opinion that it is largely from this class that the ranks of our chronic metritis patients are filled. This fact would certainly account for the somewhat low percentage of positive reactions in the present series. Also we must remember that, clinically, chronic metritis is at present somewhat a vague term and possibly several pathological lesions are included under the one heading. This being so, the Wassermann test will be of value in picking out those cases possessing a syphilitic factor and differentiating them from others which clinically present a similar picture.

The exact relation, however, which syphilitic fibrosis of the uterus bears to fibrosis due to other causes must at present remain unknown until more figures are available from various sources.

PYOMETRA.

Another uterine lesion which also appears to bear a distinct relation in some cases to syphilis is pyometra. Distension of the uterine cavity with pus is most frequently regarded as a concomitant of malignant disease. Nevertheless, the last two cases that have come under my own observation have both occurred in patients exhibiting well-marked evidence of tertiary syphilitic disease, and in whom there was no evidence, macroscopically or microscopically, of any carcinomatous change in the uterus. Dr. Thomas Wilson has also very kindly given me details of two more cases of pyometra occurring apart from malignant disease in patients who had a clear syphilitic history.

In the time allowed me for a short communication it is not possible to consider in detail this interesting association. In a later communication I hope to deal at length with the subject, and in the meantime shall be grateful for any details relating to the co-existence of pyometra and syphilis.

SYPHILIS AND THE MENSTRUAL BLOOD.

In conclusion, I wish to refer briefly to some observations recently made upon menstrual blood collected during the secondary stage of syphilis through an intra-uterine catheter. I was led to examine the material as a result of the researches of McDonagh and Ross upon syphilitic fluids and blood, which proved the existence within the white cells of an intracellular body. The relation of these intracellular inclusions to syphilis is unknown beyond the fact that they have been unobserved in man apart from the disease. It has been suggested that they are a stage in the development of the specific spirochæte. Since they have been demonstrated by several observers in the circulating blood during the secondary stage, I thought it of sufficient interest to examine the menstrual fluid on the first and second days by the *in vitro* method of staining. Altogether, five patients have been examined, and in two of these, after a prolonged search occupying several hours, I recognized the copper-coloured intracellular bodies described by the above observers as present in the circulating blood. The presence of such bodies in the menstrual fluid is important as proving a possible source of infection to the uterine tissues through which they pass. Furthermore, their existence in the menstrual blood during the secondary stage of the disease suggests that the *Spirochæta pallida* itself may be present in the same fluid, although up to the present I have been unable to find the same in films stained by Giemsa's or Levaditi's methods.

CONCLUSIONS.

The conclusions, therefore, that I think may fairly be drawn from the observations so far completed are the following:—

(1) The importance of recognizing a form of fibrosis of the uterus produced by the virus of syphilis; in other words, the existence of a true syphilitic fibrosis.

(2) The necessity of testing by the Wassermann reaction all patients who present the clinical picture of chronic metritis and fibrosis, since this test may provide the only evidence of the syphilitic nature of the affection.

(3) The exact proportion which cases of syphilitic fibrosis bear to similar gross changes produced by other factors must at present remain unknown, until a longer series of cases has been investigated.

(4) It is possible that some cases of non-malignant pyometra are also of syphilitic origin, and if no obvious signs of syphilis are present, such patients should be tested by the Wassermann reaction.

(5) It is suggested that the menstrual blood be examined for the *Spirochæta pallida*, especially during the secondary stage of syphilis, since the intracellular bodies described by Ross and McDonagh have already been demonstrated.

In conclusion, my thanks are due to my senior colleague, Dr. Thomas Wilson, for very valuable help both as regards material and suggestions.

DISCUSSION.

The PRESIDENT remarked that the Section was very much indebted to Mr. Beckwith Whitehouse for his contribution to the study of a subject of which we knew very little. He was of opinion that the result of Mr. Beckwith Whitehouse's investigation did not go further than to show the presence of the Wassermann reaction in certain cases of so-called chronic metritis, and that at present there was not sufficient evidence to prove that syphilis was the cause of the metritis. He had given antisyphilitic remedies a very thorough trial in some persistent cases which had not been much benefited by curetting; but without obvious benefit, this result could not be taken as strong evidence against syphilis as a cause. Mr. Whitehouse had pointed out the vagueness of the term "metritis," which was applied to several different conditions. It was important that the variety of metritis referred to should be very accurately defined.

Dr. AMAND ROUTH narrated two cases of intractable chronic metritis associated with syphilis, which yielded at once to specific treatment. In the one case a gumma was discovered in the neck, in the other specific infection two years previously was disclosed. He stated that his father invariably treated, and with great success, all cases of chronic metritis and endometritis with a pill containing hydrarg. perchlor. $\frac{1}{16}$ gr., acidi arseniosi $\frac{1}{20}$ gr., with some aloes. If the statistics of Mr. Whitehouse and Miss McIlroy were not exceptional, his success was fully explained.

Mr. BECKWITH WHITEHOUSE, in reply, said that he was much interested in the experiences detailed by the President and Dr. Amand Routh. He quite agreed with all the speakers that a long series of cases was required before a true estimate could be formed as to the frequency of syphilitic fibrosis of the uterus. In fact, he had made this observation in the course of the paper, which was primarily intended to draw attention to the subject and serve as a preliminary report. As regards the collection of material, he could honestly say that in the short list he had brought forward the cases were not in any sense of the word "picked." They occurred in the ordinary course of hospital practice and formed a successive series of patients with a clinical diagnosis of chronic metritis, investigated by means of the Wassermann reaction. This reaction had shown that, although other signs of syphilis were absent, the patient might still be infected, and he was firmly convinced that this disease was the basis of a certain number of cases of uterine fibrosis. The pathological appearances were identical with those seen in other organs which were generally accepted as being due to syphilis.

A Specimen of Fœtus Acardiacus Amorphus.

By Matthew J. Stewart, M.B.

The fœtus amorphus is one of the least common of all the monsters. So far as I can gather from the *Proceedings*, only two examples from the human subject, one of them quite atypical, have been shown before this Society. In 1892 Dr. Herman showed an amorphous fœtus of a rather unusual kind, in that it tended to approximate to the type of fœtus acormus, while in 1899 Dr. Arnold Lea gave a communication on "A Tumour expelled from the Uterus during Labour." In their report on that specimen Dr. Eden, Mr. Bland-Sutton and Dr. Lea concluded that the tumour was an acardiac fœtus in which the arrest of development had occurred at a very early period of fœtal life, before the period of clear differentiation of the various organs. A further proof of the extreme rarity of the condition, which, moreover, is one unlikely to escape the notice and comment of obstetricians, is that in 1895 Ballantyne[1] found only twenty-four cases on record, the earliest being Benedetti's in 1533, while Mr. Alban Doran,[2] in a communication to the Obstetrical Society in 1889, stated that he could find no genuine amorphus in any London museum. Several examples of acephalus and of mylacephalus, the most nearly related of the acardiac monsters, are, however, recorded in the *Proceedings*.

The present specimen is a typical but not extreme example of the fœtus amorphus seu anideus. It is not absolutely formless, since it does bear some resemblance to a human trunk, therein differing markedly from the specimens figured in Bland-Sutton's "Tumours, Innocent and Malignant," in Birnbaum and Blacker's "Clinical Manual of Malformations of the Fœtus," and in "Teratologia," vols. i and ii.

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[1] "Teratologia," i, p. 1.

[2] *Trans. Obstet. Soc. Lond.* (1889) 1890, xxxi, p. 4.

CLINICAL NOTES BY W. SIM GARDEN, M.D.

The mother was a healthy young woman, and the pregnancy, which was her first, ran a perfectly normal course. The father also enjoyed good health. The pregnancy ended at term, and delivery occurred naturally. The monster was born first, and half an hour later a healthy male child. There was a common placenta, but details are lacking as to the relationship of the cords and membranes. The living child appeared to be normal in every way, and is now, eighteen months later, alive and well.

DESCRIPTION OF THE EXTERIOR OF THE MONSTER.

The monster to all intents and purposes presents the appearance of a trunk without head or limbs. It measures 14 cm. in length, 9·5 cm. in breadth, and 7·5 cm. in thickness, and exhibits sundry dimples and projections, some of which at first sight do not bear any definite resemblance to normal structures. The flat ventral aspect is at once distinguished by the presence near its centre of an umbilicus, from which projects an umbilical cord. The dorsal aspect, on the other hand, is slightly convex, with a mesial antero-posterior furrow similar to the groove which normally overlies the vertebral column. Apart from this, the dorsal aspect presents no projections or depressions of any kind, though it is covered, especially in the mesial groove, by a fine growth of hair. Although the two extremities of the monster are very different in appearance, it is a matter of considerable difficulty to decide, at first sight, which is head and which tail end. Subsequent radiography and dissection, however, make this point clear. At the posterior end, then, there are apparently well-formed nates with an anal-like dimple between, and about 2·5 cm. ventral to the latter two other mesial dimples 12 mm. apart, possibly corresponding to genital and urinary apertures respectively. Lateral to these dimples, and about 2·5 cm. from the middle line, there is a pair of thumb-like projections, one on each side, approximately 6 mm. in length by 4 mm. in diameter, attached to the trunk by a somewhat constricted pedicle. They are probably the vestigial representatives of the lower limbs. At the anterior extremity of the trunk there are also two nates-like eminences, which, however, are more ventrally situated, while between them, on the ventral aspect, is a fairly deep median depression, from the centre of which projects a fluid-filled, thin-walled sac about the size and shape of a cherry. It arises by a fairly broad pedicle, from a rent in which a little of the contained fluid oozes on pressure. Near the attachment of the pedicle to the trunk a small tuft of hair arises. On either side of the lower end of this upper median depression, and situated about 2 cm. from it, there is a small circumscribed dimple presenting an appearance not unlike that of a completely retracted nipple. They correspond roughly with the position occupied by the thumb-like projections at opposite end of the trunk, and possibly indicate the situation of the upper limbs.

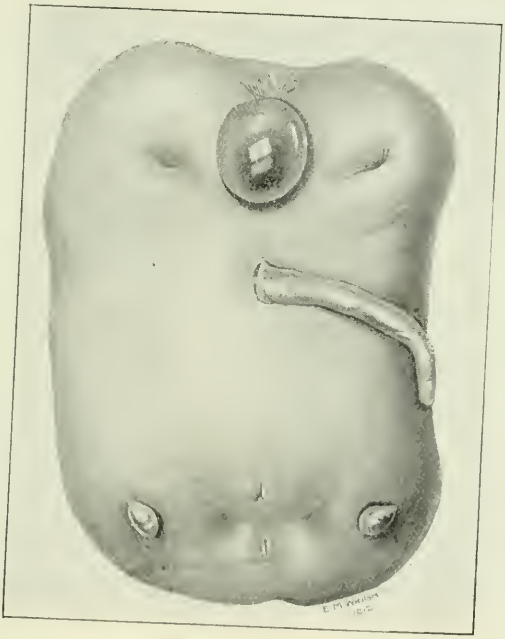

FIG. 1.

Ventral aspect of fœtus amorphus.

RADIOGRAPHIC EXAMINATION.

This shows the presence of a vertebral column consisting of some eighteen segments, to the upper seven of which ribs are attached. The latter are widely splayed and are not united in front, the sternum being absent. At the upper extremity of the vertebral column there is a small plate of bone, triangular in shape when viewed from the lateral aspect, which probably represents the base of the skull; otherwise there is no evidence of cranial bones; and appearances point also to the absence of any cervical spine. Posteriorly the pelvis is represented by two bones on each side, a broad upper plate (the ilium) and a smaller lower one (? the ischio-pubis). Of limb bones there is otherwise not the slightest trace.

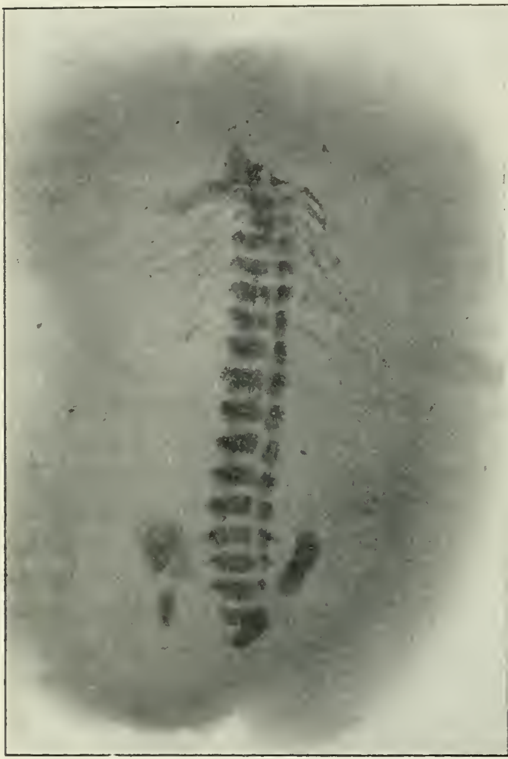

Fig. 2.

Skiagram of fœtus amorphus (dorso-ventral aspect).

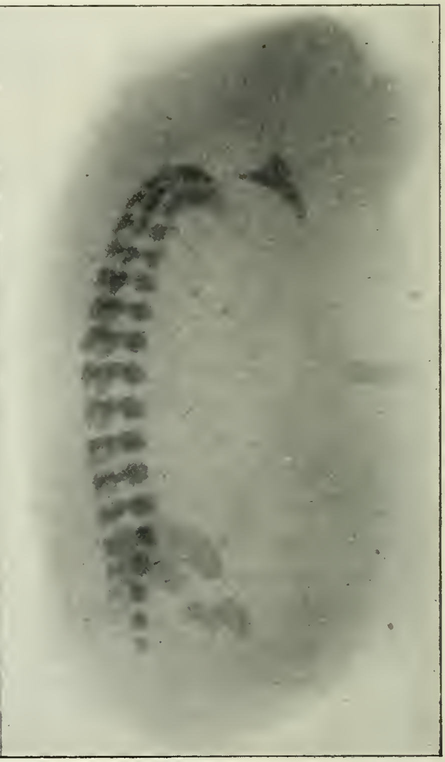

Fig. 3.

Skiagram of fœtus amorphus (lateral aspect).

For the accompanying photographs I am much indebted to Dr. Rowden, Honorary Radiographer to the General Infirmary at Leeds

DISSECTION OF THE MONSTER.

This was commenced by making an oval incision and removing the whole anterior cutaneous surface *en masse*. The first thing noticed was that the subcutaneous tissues were in an extremely œdematous condition, exuding a large amount of clear yellow fluid as soon as the skin was incised. Several ounces in all escaped in this fashion, causing the monster to assume a curious shrunken appearance. This œdematous subcutaneous tissue indeed seemed to constitute the chief bulk of the fœtus. It was clear and gelatinous in appearance, with innumerable small opaque yellow granules scattered through it, shown by the microscope to be developing adipose tissue. In the midst of this myxomatous tissue were several large cystic spaces filled with fluid, notably on either side of the rudimentary thorax, which was now laid bare by dissection. The thorax was formed by seven ribs on each side, but was without sternum or indeed any form of anterior junction by bone or cartilage. At the other end of the trunk was the rudimentary pelvis. No trace of a body cavity, either thoracic or abdominal, could be made out, but dissection revealed the presence of a variety of solid and hollow viscera, chiefly in the lower half of the trunk. The organs found could not be distinguished with certainty by the naked eye, but the true nature of each was subsequently demonstrated by the microscope. There were two mesial organs, one above the other, the upper of which was a fairly bulky, more or less globular structure of a dark red colour. On section a considerable amount of fluid blood escaped, and as the organ was situated in the lower costal regions, it was at first regarded as possibly a rudimentary heart; microscopically it proved to be the liver, excessively engorged with blood. Beneath it lay the other mesial organ, a broad tubular structure, apparently closed at both ends and measuring about an inch in length. It extended from the liver downwards towards the pelvis, and proved to be bowel. In the lower part of the "abdomen," laterally situated, were two pairs of solid organs, ovoid in shape and of a dark red colour—viz., kidneys above and testes below. From the inner aspect of the former two narrow, white, parallel tubes, the ureters, ran downwards into the pelvic region. No trace of heart or lungs was to be found either macroscopically or microscopically, nor were the adrenals present.

In order to preserve the specimen as much as possible for museum purposes, no dissection of the skeleton was attempted, but the skiagrams go far towards supplying this defect.

MICROSCOPIC EXAMINATION OF THE ORGANS.

The liver can only be recognized with certainty at the periphery of the organ, where there are columns and masses of typical polygonal liver cells with large nuclei. No bile-ducts can be determined, nor is there any evidence of lobulation. The columns of cells are separated by large blood-filled capillaries, whose endothelial lining can usually be made out with great distinctness. Towards the centre of the organ the capillary mesh-work becomes enormously distended, and the structure is further obscured by the presence of a large amount of free, effused blood, amongst which are a few isolated liver cells.

The kidney, which is determined at the first glance, shows well-marked differentiation into cortex and medulla. The former contains numerous glomeruli of small size, and many uriniferous tubules, the whole being bound together by a copious cellular stroma. The glomerular tufts are very cellular, and are covered by cubical epithelium, while Bowman's capsule is lined by a layer of flattened cells. The uriniferous tubules are well formed, except that many of them lack a lumen. The medulla consists of a bulky, rather myxomatous stroma of oval and spindle cells, through which run the collecting tubules. These are few in number, and somewhat tortuous in their course, while many of them are poorly luminated. The whole organ is permeated by numerous wide capillaries, and there are many thick-walled vessels (arteries and veins) at the line of junction of cortex and medulla. The renal pelvis is lined by columnar epithelium several layers deep, and is widely patent.

The ureter is a well-defined, thick-walled tube running downwards from the kidney. It is lined by columnar and subcolumnar epithelium several layers deep, outside which is a broad myxomatous submucosa constituting the chief part of the thickness of the wall. Outside this, again, is the much thinner muscular coat.

The testis consists of numerous solid cords of round and oval epithelial cells, the seminiferous tubules, with an abundant cellular stroma filling up the interstices. The alveoli have a well-marked basement membrane of flattened cells, inside which are several layers of epithelium, completely filling up the lumen. In the layer next to the basement membrane there are a few large polygonal cells with large round nuclei, the spermatogonia. The rest of the cells are smaller and more elongated, with round or oval, deeply staining nuclei, probably undifferentiated epithelial cells. Only a few karyokinetic figures have been observed. The cells of the stroma are large and polygonal, with large round nuclei, and finely granular cytoplasm staining deeply with eosin. These are the interstitial cells of Leydig, and in this instance they certainly resemble epithelial rather than connective tissue cells.

The epididymis is attached to the testis, and consists of a series of well luminated tubules, each of which is lined by a single layer of columnar ciliated epithelium with basally situated nuclei. Outside the basement membrane there are several concentric layers of spindle-celled tissue (? unstriped muscle) and outside this an abundant fibromyxomatous stroma with many wide, thin-walled vessels.

The intestine is a short tube about 3 mm. in diameter with a well-formed wall nearly a millimetre thick. The mucous membrane, which is thin and simple looking, resembles that of the large intestine. There is a thin submucosa and a well-formed muscular coat with both circular and longitudinal layers.

In what corresponds to the mesocolon there is a small nodule of lymphoid tissue surrounded by lymph spaces, clearly a lymphatic gland ; and many other lymphatic channels lined by a single layer of endothelium may be seen scattered throughout the connective tissue. Arteries, veins and capillaries, as well as nerves, are also present.

The skin is exceedingly thin, but all the layers are present, including stratum corneum, which is partly desquamated. There are a few small hairs, each with a very small sebaceous gland and a very large arrector muscle attached to the root follicle. Sweat-glands are well formed. The cutis vera is fibromyxomatous, the subcutaneous tissue myxomatous, and in the latter there are numerous small nodules of developing adipose tissue. Blood-vessels are plentiful, and it is possible to distinguish arteries, veins and capillaries. The walls of the arteries are slightly thicker than those of the veins, and although the chief bulk of the thickness is formed by the fibrous adventitia, the media undoubtedly contains unstriped muscle. This is well shown in sections stained by Mallory's connective tissue method. Many wide lymph channels are also present, and a few lymphoid nodules (developing lymphatic glands) may be seen in the deeper portions of the subcutaneous tissue.

I have ventured to bring forward this specimen not only on account of the rarity of the condition, but also because, in the great majority of the recorded cases, no systematic histological study of the organs has been carried out. In the present instance I was fortunate enough to get the specimen within twenty-four hours of delivery, and thus to obtain comparatively fresh material for microscopic examination.

Dr Wilberforce Smith gave an epidiascopic demonstration of Altmann's granules in tissues, at the point of invasion by squamous carcinoma of the uterus.

Obstetrical and Gynæcological Section.

January 8, 1914.

Dr. W. S. A. Griffith, President of the Section, in the Chair.

Case of Primary Epithelioma of the Vagina treated by Radium.

By W. S. A. Griffith, M.D.

Mrs. A., aged 67. One child at the age of 30, no miscarriage. Menstruation always scanty, ceased at the age of 50. Health generally good, but has recently suffered from glaucoma and cataract in both eyes. Weight average.

October, 1912: Mucous leucorrhœa first noticed, sometimes tinged with blood, but there has been no hæmorrhage nor any pain.

June 3, 1913: Examined under anæsthesia by Dr. Griffith, who found a warty papillary growth of the posterior fornix about 1½ in. in length and 1 in. in breadth, apparently involving the whole thickness of the thin senile vagina, but the rectal wall was quite free. The cervix was senile and healthy. A portion was removed and found to be squamous-celled epithelioma.

Treatment by radium by Mr. A. E. Pinch at the Radium Institute.

June 16: 25 mg. screen, 1 mm. silver, six hours.

June 17 to 20: 50 mg. screen, 2 mm. lead, six hours each day.

July 25: Mr. Pinch found that the greater part of the growth had disappeared, leaving a small patch the size of a sixpence, and gave another course of radium.

July 25 to 29: 25 mg. radium, screen 1·5 mm. lead, each day for six hours.

October 14: Dr. Griffith examined and found no trace of disease; the vagina was smooth and soft, but a little more contracted than in June.

Dr. Griffith reported this isolated case for two reasons, because primary epithelioma of the vagina is a comparatively rare disease, and because of its anatomical relations treatment by operation is not very satisfactory, whether by partial excision, as in C. H. Robert's case, by excision of the whole vagina (Olshausen), or by excision of the vagina and uterus (Amann).

Primary epithelioma of the vagina is found most frequently between the ages of 30 and 40, and for some not known reason commences usually in the upper part of the posterior wall. C. H. Roberts reported a case to the Obstetrical Society[1] and gives some account of the disease in his "Gynæcological Pathology," p. 38. Dr. F. J. McCann also reported a case which remained free from recurrence for two years. He performed vaginal hysterectomy, excising the affected portion of the vagina.[2] Among other English authors reference may be made to an article in West's "Diseases of Women," 1870, in which he discusses nineteen cases of cancer of the vagina. The pathological anatomy of these is, as might be expected, the least valuable portion of the article. Smyly gives a short account of the disease in Allbutt's "System of Gynæcology," 1906, p. 708. The most valuable contribution, and one to which most writers refer, is by Kustner.[3] He collected twenty-four cases, the majority of them being between the ages of 30 and 40. Olshausen, "Ueber Extirpation der Vagina,"[4] discusses this method of treatment. He records eighteen cases in his clinic; in thirteen of these the posterior vaginal wall was the seat of disease. Amann[5] records a case of a woman, aged 58, in which he resected the whole vagina and uterus, the patient being well two years afterwards. Jayle and Bender,[6] in an interesting paper on "Leucoplasia of the Vulva, Vagina and of the Uterus," say that leucoplasia of the vagina is rare and usually an extension from the vulva. They describe two cases of the very rare primary leucoplasia of the vagina: (1) In a woman, aged 62, complicating epithelioma of the cervix; (2) a case recorded by Pichevin and Pettit,[7] a woman, aged 68, associated with primary epithelioma of the vagina. Professor Schöttlander and Dr. Kermauner, of the University Frauenklinik, Vienna, in their great monograph on "Carcinoma of the Uterus" (1912), pp. 381, 658, describe five cases of carcinoma of the vagina, but none of them appear to be primary.

Dr. Griffith hoped to be able to report the further progress of his case to the Section, and suggested that all gynæcological cases treated by radium and of which accurate details were obtained should be reported. He referred to the admirable address by Sir A. Pearce Gould, reported in the *British Medical Journal* of January 3, 1914, as an example to be followed in reporting cases treated by radium at the present time.

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[1] *Trans. Obstet. Soc. Lond.* (1896), 1897, xxxviii, p. 381.

[2] *Trans. Obstet. Soc. Lond.* (1906), 1907, xlviii, p. 181.

[3] *Arch. f. Gyn.*, Berl., 1876, ix, pp. 279-90.

[4] *Centralb. f. Gyn.*, Leipz., 1895, xix, p. 1.

[5] *Monats. f. Geb. u. Gyn.*, Berl., 1904, xix, p. 888.

[6] *Rev. de Gyn. et de Chir. abdom.*, Par., 1905, ix, p. 984.

[7] *Semaine Gynéc.*, Par., 1897, ii, p. 259.

DISCUSSION.

Dr. MACNAUGHTON-JONES said that he had had two cases of carcinoma of the vagina, one of which he had brought before the Gynæcological Society and the other he had referred to in this Section. In 1909[1] he had summarized all the literature which had been published up to that date on the subject. At the same time he had collected also the various cases which had been recorded in the United Kingdom, and had ascertained the views and what the experience had been of most of the living gynæcologists, both at home and in Germany, as well as of others on the Continent, in America, and Canada. The results of the inquiries went to prove, first, that carcinoma of the vagina was comparatively a very rare affection in the experience of all whom he had approached; also, that operative results were very unfavourable and that the seat of the affection was most frequently the upper portion of the posterior wall of the vagina, as in the President's case.

Dr. ANDREWS said that he had shown a case of primary carcinoma of the vagina at a meeting of the Section in March, 1909.[2] The patient was aged 62. For six months she had complained of very irritating, watery, odourless vaginal discharge, blood-stained at times, more profuse for the last two months. High up on the posterior wall of the vagina to the right of the middle line was an ulcer about the size of a two-shilling piece. The whole vagina was removed from below together with the uterus. Sections showed squamous-celled carcinoma. Sections of the adjacent part of the cervix showed no malignant infiltration. The operation was performed in September, 1907. Dr. Andrews saw the patient on January 6, 1914, six and a half years after the operation. She was in excellent health and there was no sign of recurrence.

Mr. CUTHBERT LOCKYER mentioned three cases of primary epithelioma of the vagina upon which he had operated. In one this growth was situated on the posterior wall high up in a sulcus formed by ulceration, due to a neglected vulcanite pessary. The posterior vaginal wall was removed, but recurrence took place in four months. The second case was that of an epitheliomatous ulcer covering one side of a complete procidentia. The whole of the procidented vagina was removed. The patient in this case was lost sight of. The third case was very advanced and the growth took a serpentine course involving the right lateral wall and also the back and front of the vagina. The left wall was free from growth. The vagina was removed as an entire tube. The bladder wall behind the urethra was very adherent, and a portion of this thickened tissue was removed subsequent to the colpectomy. It was found to be free of cancer microscopically, nevertheless, the patient had a recurrence in less than six months.

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[1] *Proceedings*, 1909, ii, p. 251.

[2] *Ibid.*, 1909, ii, p. 248.

Double Ovariotomy; Bilateral Ovarian Perithelioma; Dermoid on One Side; Unusual Post-operative Course.

By C. Hamilton Whiteford.

Previous history: In August, 1910, the patient, aged 78, a 4-para, came under my care for strangulation of the pelvic colon in a right femoral hernia. The sac and bowel wall were so grossly infected that the pelvic colon was opened and drained through the lower portion of the right rectus muscle. A prolonged convalescence followed. The infected tissues sloughed very freely, resulting in a large incisional hernia. The pulse throughout was weak and intermitting, and recovery appeared due to the large amount of champagne taken, which, for many days, was practically the only nourishment absorbed. In view of the patient's age, general condition, and poor pulse, no further operation was undertaken, the colostomy and large protrusion in the femoral region causing but slight inconvenience.

Present illness: Early in the year 1913 the lower abdomen began to enlarge. Seen in June, 1913, the lower abdomen was found enormously distended and covered with large dilated veins. The left lower quadrant was dull on percussion and had a marked thrill. The intra-abdominal pressure was causing much discomfort and œdema of both legs. Puncture, with a trocar, of an abdomen in which the arrangement of abdominal viscera was far from normal appeared more than usually risky, and it was decided to expose the tumour by a small incision.

Operation: On June 23, under infiltration anæsthesia (novocain and adrenalin), with a hypodermic injection of morphia, the abdomen was explored through a vertical 2-in. incision in the left lower rectus muscle. The parietal peritoneum and cyst wall were (unintentionally) incised simultaneously. Five pints of odourless, yellow, creamy fluid poured out. A coil of brown hair, 6 in. in length, protruded and, being unattached, was removed. The cyst collapsed into the pelvis and could not be brought to the surface. Five hours later cœliotomy was performed under ether anæsthesia. A large multilocular dermoid cyst occupied the left broad ligament. The cyst wall was incorporated with the peritoneum of the broad ligament and was firmly adherent to the pelvic floor. Difficulty of access prolonged the operation considerably. The pelvic colon, adherent at the site of the colostomy (which was shut off with rubber sheeting), prevented displacement of the intestines to any appreciable extent. The bladder, large and displaced to the left, was much in evidence. An abdominal evacuator, worked by water suction, was of the greatest assistance in keeping the operation area free from fluid, 7 pints of which were removed. This, with the 5 pints previously evacuated, made a total of 1½ gallons. The broad ligament and cyst wall were transfixed and tied in many sections. The fundus uteri and right ovary were also removed. Small portions of cyst wall were left adherent to the pelvic floor. The abdomen was closed without drainage.

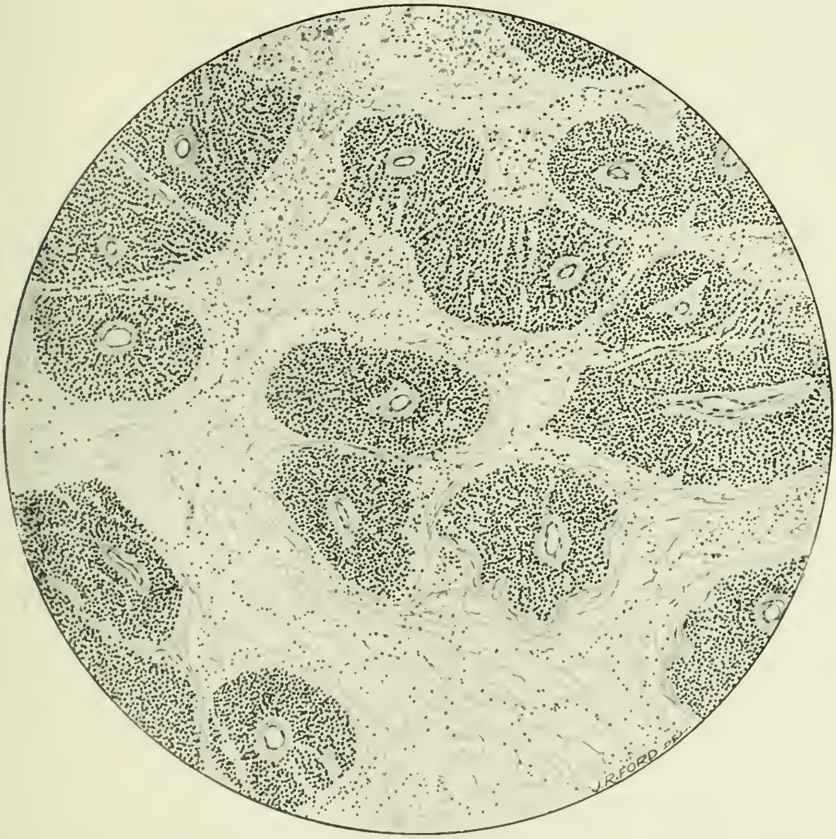
Parts removed: These were in one piece. The largest loculus, whose walls were in places ¼ in. in thickness, was lined with skin devoid of hair. Attached to its inner surface by a pedicle was a smooth egg-shaped tumour, 1½ in. by 1 in. The shell of this tumour was thin bone, and its contents cancellous bone with fatty debris. The smaller loculi contained either material resembling dense connective tissue, or fluids, some of which were a turbid brown and others a fatty yellow. Adherent to the left cyst was the fundus uteri, and beyond this, attached by its ligament, was the right ovary forming an oval mass, 3½ in. by 1½ in., some of its loculi containing cheesy material and others more solid matter, resembling fibrous tissue.

After-history: The abdominal incision was but slightly infected and healed well. The œdema of the legs rapidly disappeared, as did the dilated abdominal veins. Thirteenth day: The temperature varied between 99° and 101·5° F., and the pulse between 90 and 120. The leucocyte count was 1,460. The presence in the left iliac fossa of a tense tumour, palpable *per vaginam*, suggested an infected hæmatoma. Under ether anæsthesia, through an incision in the outer portion of the left rectus muscle, the tumour was exposed, and found exactly to simulate a cyst in the left broad ligament. The tumour projected into the general peritoneal cavity, which was packed off with gauze. Fifteenth day: There was withdrawn from the tumour, in a syringe, 5 oz. of inodorous, thin, blood-stained fluid, cultures of which showed only a few saprophytic organisms. Twenty-first day: The fluid showing no sign of being absorbed, 46 oz. of brown, slightly turbid, odourless, alkaline fluid, with a thick sediment of fatty material, were removed by a Potain aspirator. Twenty-eighth day: 20 oz. of similar fluid were aspirated. The examination of this fluid for urea was negative. Fortieth day: Through drainage was established by a rubber tube, with lateral openings, passed under ether anæsthesia from the iliac incision through the posterior vaginal wall. Fifty-sixth day: The discharge from the iliac incision became a bright greenish blue. On culture, the *Bacillus pyocyaneus*, probably derived from adjacent intestine, was found. At the end of four months the heart rapidly failed and death occurred in a week.

Autopsy: Small masses of hard white growth (the total amount of which equalled in size a lawn-tennis ball), with a few small cysts containing clear watery fluid, occupied the left pelvic floor. The left inferior quadrant of the abdomen was everywhere shut off by adhesions from the general cavity of the peritoneum, in which there were neither fluid, secondary growths, nor other abnormality. The peritoneum in the shut-off operation area was obliterated by adhesions. The bladder was uninjured. The left ureter, dissected out from kidney to bladder, was intact.

Comments: At the time of operation, except for the advanced age of the patient and the adherence of the cyst wall to the pelvic floor, there was little to suggest malignancy. The behaviour of the portions of cyst which were left attached to the pelvic floor appears unusual and may be summed up as a production of a minimum of growth with a maximum of fluid. In three weeks 51 oz. of fluid were secreted, and the broad ligament, although practically completely extirpated at the operation, was almost completely re-formed. After institution of the through drainage, which was continued throughout, watery fluid, sometimes with fatty debris and a little pus, dribbled almost continuously from both ends of the drainage-tube. The accumulation in twenty-one days of watery fluid to the amount of 51 oz., followed by the constant leakage of similar fluid, suggested the possibility of an injury to the left ureter. But against this were the following facts: The urine from the bladder averaged daily over 2 pints (the daily diet averaged 4 pints of milk with champagne or brandy). On estimating what would be a normal amount of urine, allowance had to be made for water in the fæces from the colostomy, the motions often being very loose. The results of examinations for urea in the fluid from the sinus were always negative. Methylene blue, given by mouth, while rapidly colouring the urine passed from the bladder, invariably failed to colour the fluid escaping from the drainage-tube. Cystoscopy was not performed, and in the distorted condition of the pelvic viscera, would probably have been useless. The autopsy showed the bladder and ureter to be intact. The operation, by removing the great abdominal distension and œdema of the legs, gave the patient four months of relative comfort.

The reasons for regarding the copious watery discharge, which persisted for four months, as being formed by the growth rather than by the peritoneum are: (1) The accumulation of fluid was *behind*, not in the cavity of, the peritoneum; (2) the peritoneum in the operation area was practically obliterated, while the growth was present in abundance; (3) since it is the function of normal endothelium to secrete a watery fluid, there is no reason why abnormal endothelium (perithelioma) should not produce a somewhat similar secretion.



Case of bilateral ovarian perithelioma. (× 65; obj. 1 in.; eyepiece No. 4, Leitz.) Section showing collections of round mesoblastic cells arranged concentrically to the vessels.

Remarks by Mr. Cuthbert Lockyer.—The cyst wall, on section, is composed of dense fibrous tissue, much convoluted on its inner surface, where it is covered by flattened epithelium slightly heaped up in the depths of the furrows caused by the folds. In the fibrous tissue there are several firm nodules and these, on section, show the typical structure of a peritheliomatous growth arising either from blood-vessels or from lymphatics. One of these nodules lies at the base of the calcareous lump described by Mr. Whiteford. Both ovaries show the same type of growth, so that the case is one of bilateral perithelioma of the ovaries, in which the left (large) ovary also contained a dermoid. The additional malignant growths found at the autopsy—whether secondary or the remains of the primary growth—will account for the curious clinical feature of continuous local excitation of peritoneal secretion from that part of the membrane involved in the operation area. The fact that the general peritoneal cavity contained no fluid would be explained by its being shut off by adhesions.

Case of Chorionepithelioma of the Uterus with Bilateral Lutein Cysts of the Ovary.

By T. Watts Eden, M.D.

M. H. aged 27, was admitted to the Chelsea Hospital for Women on February 1, 1911, complaining of hæmorrhage and enlargement of the abdomen. Her obstetric history was that she had had her first confinement a year and nine months previously, labour having been terminated with forceps, and had nursed her child for nine months. Menstruation had been regular and normal for some months up to October, 1910. The period due in the second week of November was missed; three weeks later she fell over a stool and hurt herself considerably. The next day a severe hæmorrhage occurred, and since then a variable amount of bleeding had occurred daily, but it was never again profuse. The bleeding had consequently been present for about eight weeks without intermission when she entered the hospital. She had had a certain amount of dragging pain on the left side, and during the last few weeks the abdomen had increased rapidly in size and there was a constant distressing feeling of distension. She also complained of feeling weak and ill, and said that she had lost weight.

On admission her temperature was 100° F., her pulse 136; there was a moderate degree of anæmia, and her general condition appeared to be fairly good. She had a double mitral murmur, but the pulse was regular, there was no œdema, and the urine was free from albumin and sugar. The fundus of the uterus reached a level about midway between the umbilicus and the tip of the ensiform cartilage. Its consistence was soft and uniform, no contractions could be detected, no fœtal parts felt, and no fœtal heart sounds heard. The cervix was definitely softened and sufficiently patent to admit the tip of the index-finger through the internal os. Only loose blood-clot could be felt by the finger.

The next day, under anæsthesia, the finger was passed into the uterus, and masses of vesicles being encountered, the diagnosis of vesicular mole was clear, and the uterus was forthwith evacuated. After dilating the cervix to the fullest possible extent with graduated dilators it was decided, on account of the large size of the uterus, to provide freer access by dividing the cervix. Accordingly a transverse incision was made across the anterior vaginal insertion, the bladder separated from the cervix by blunt dissection, and the anterior wall of the cervix divided in the middle above the level of the internal os. It was then easy to clear out the uterus with the finger and a pair of ovum forceps aided by intra-uterine douching. A very large mass of vesicles was removed, estimated at about a quart; they were characteristic of the well-known vesicular or hydatidiform moles. On exploring the uterine cavity with the finger after the contents had been completely removed, an area was detected occupying the upper part of the anterior wall which felt hard and nodular, and the whole wall at that spot appeared to be thicker than elsewhere. The fear was expressed that this area might be the seat of malignant changes, but the amount of blood already lost had been considerable, and it was thought undesirable to further explore its nature at that time. The incisions in the cervix and in the anterior vaginal wall were closed with interrupted catgut stitches and the vagina lightly plugged with gauze.

Convalescence was favourable in all respects. For three days the temperature fluctuated between 99° and 101° F., and thereafter became normal, the pulse-rate gradually falling to normal after about the same interval. The amount of bleeding after the operation was inconsiderable and the discharge ceased entirely within a week. On this occasion a careful bimanual examination of the uterus was made; involution was slow during the first week, but proceeded rapidly during the second, and when the patient left the hospital on the twentieth day after the operation the local condition appeared to be normal in all respects, the uterus being well involuted and the appendages showing no appreciable change. The patient then went to the convalescent home, and was instructed to report herself at the hospital on her return.

Pathologist's Report on the Vesicular Mole (Mr. Bryden Glendining).—The sections consist of chorionic villi showing central myxomatous degeneration, with masses of syncytium adherent in many places to Langhans's layer. The cellular activity shows a suggestion of a hydatid mole having malignant characters.

Further progress: The patient remained at the convalescent home for six weeks, and returned greatly improved in health. On April 5 I saw and examined her again. She had gained weight, her colour was good, and she expressed herself as feeling perfectly well. No menstrual period had occurred since the operation. On examination the uterus was found to be in the normal position, but somewhat bulky; the amount of enlargement was, however, inconsiderable. In the position of the left ovary was a soft, movable, non-sensitive swelling of the size of a golf-ball. There had been no discharge, hæmorrhagic or otherwise. Judging from the great improvement in the general condition of the patient, it seemed highly improbable that the swelling noted on the left side could be a secondary malignant deposit, and it was therefore decided to do nothing in the meantime and see the patient again in a fortnight. Accordingly, on April 19, a second examination was made. The patient then appeared to have lost ground and looked paler and thinner. A normal menstrual period occurred in the second week of April. On internal examination no further change was detected in the uterus; the swelling on the left side had increased greatly in size and was definitely cystic, and of quite irregular shape. Behind and to the right of the uterus could now be felt a second freely movable swelling, also cystic and more globular in shape, and apparently about half the size of that felt on the left. No swelling was detected in this position at the examination made fourteen days previously. There was still no hæmorrhagic or other kind of discharge.

Although the two swellings, from their consistence and mobility, were apparently cysts, their rate of growth was obviously extraordinarily rapid, exceeding greatly anything with which we are acquainted in the case of benign growths. It was accordingly decided that an abdominal operation should be performed so that a more accurate diagnosis could be made. The nodular thickening on the uterine wall, noted at the first operation, had raised the suspicion of malignancy, and the rapid formation and increase of these swellings after an interval of nearly three months appeared to indicate that this suspicion may have been justified.

The second operation was performed on April 20. The two swellings were seen to be thin-walled translucent cysts of the ovary, the whole of the ovarian substance being apparently destroyed in each case. The uterus was enlarged to a slight extent, and in its anterior wall was felt a small rounded nodule which appeared to be a small interstitial fibroid. No trace of infiltration or of secondary deposits could be found, and it was then thought that the question of malignancy could be negatived, for there was no evidence of it in the condition of any of the pelvic organs. Supra-vaginal hysterectomy, with removal of both tubes and ovaries, was therefore performed, the uterus being taken mainly for the reason that there was no object in leaving it when both ovaries had to be removed, and a fibroid growth was present in it.

On opening the uterus after the operation had been completed it was seen that the supposed fibroid nodule was, in reality, a mass of softish hæmorrhagic growth in the uterine wall, and the parts were then handed over to the pathologist without being further disturbed.

Pathologist's Report (Mr. Glendining).—The specimen consists of a uterus with the appendages attached. The uterus is somewhat enlarged and shows two slightly raised nodules on the surface, which correspond respectively to the insertion of the left round ligament and to the posterior part of the right horn. They are of a reddish colour. On cutting into the uterine wall these two nodules show similar characters of soft, mottled, red growth about 2 cm. in diameter, roughly spherical and shading off into the surrounding uterine musculature. The endometrium appears injected but shows no abnormal growth. Both ovaries are cystic. The right shows a thin-walled translutein cyst arising in the upper and outer part, with the remains of the ovarian tissue on the posterior part of the cyst. After fixation in formalin the contents set into a yellowish, stiff, gelatinous material. The left ovary shows a smaller cyst with ovarian tissue spread over the walls, and similar contents to the cyst of the right side. Sections of the growth masses in the uterine wall show blood and degenerate epithelium centrally, and at the periphery cellular new growth consisting of festooned masses of syncytium and a mass of vesicular epithelium evidently of the Langhans's cell type. Considerable variations occur in the cell characters, but the histological picture is that of a typical chorionepitheliomatous growth invading muscle tissue and showing in the periphery round cell collections, some degeneration of muscle, and dilated vessels. The sections of the uterine wall and endometrium from other regions of the uterus show extensive round cell infiltration of the inner third of the musculature and an occasional large ovoid cell with a large, dark, richly chromatic nucleus. The sections through the wall of the ovarian cyst show masses of lutein tissue in the wall, resting upon an ovarian stroma. To sum up: The condition is that of a chorionepithelioma invading the uterine wall deeply in two discrete sites, and associated with this malignant growth lutein cysts are present in the ovaries.

The patient made an uninterrupted recovery from the operation. Since that time she has been several times seen and examined, the last occasion having been in October, 1913. She was then in good health and presented no local or general signs of recurrence, two and a half years having elapsed since the removal of the uterus.

Remarks.—From the pathological standpoint the case presented no features calling for special comment. The association of chorion-epithelioma with a vesicular mole and with lutein cysts of the ovary was well recognized; at the same time it must be admitted that the significance of the latter association had never been satisfactorily cleared up. From the clinical standpoint there were three points to which special interest attached: (1) The total absence of hæmorrhage or discharge after the removal of the vesicular mole although a malignant growth was present in the uterus; (2) the great rapidity with which the ovarian cysts grew; and (3) the complete operative cure which had resulted.

Lipomatosis of a Fibromyoma of the Corpus Uteri.

By GORDON LEY, F.R.C.S.

THE specimen was removed from a parous woman, aged 54, on August 15, 1913. Her menopause had occurred six years previously; but for the last year hæmorrhage had recurred, and at the date of operation she was losing twenty-one days in every month. She had no pain. The tumour gave the physical signs of a fibroid uterus, and was removed by Dr. Drummond Maxwell at the London Hospital. The patient was not a fat woman.

Macroscopic appearances of specimen: The specimen is a uterus removed by subtotal hysterectomy. It measures 13 cm. in length by 12 cm. from cornu to cornu. A rounded tumour measuring 12 cm. in diameter lies in the muscular tissue of the posterior wall, widening and lengthening the uterine cavity. The endometrium is smooth. On section the tumour is composed of closely set, rounded nodules ranging from 1 to 3 cm. in diameter. The smallest of these are white, and have the typical appearance of fibromyomata; those of intermediate size are white, with yellow streaks running through them; the largest are yellow and homogeneous. The nodules are separated by strands of pinkish vascular tissue. The tumour is sharply demarcated from the surrounding muscle. Sections were taken and stained with Ehrlich's hæmatoxylin and eosin, and with Weigert's iron hæmatoxylin and Van Gieson. Other pieces were frozen, and sections stained with Sudan III and Ehrlich's hæmatoxylin.

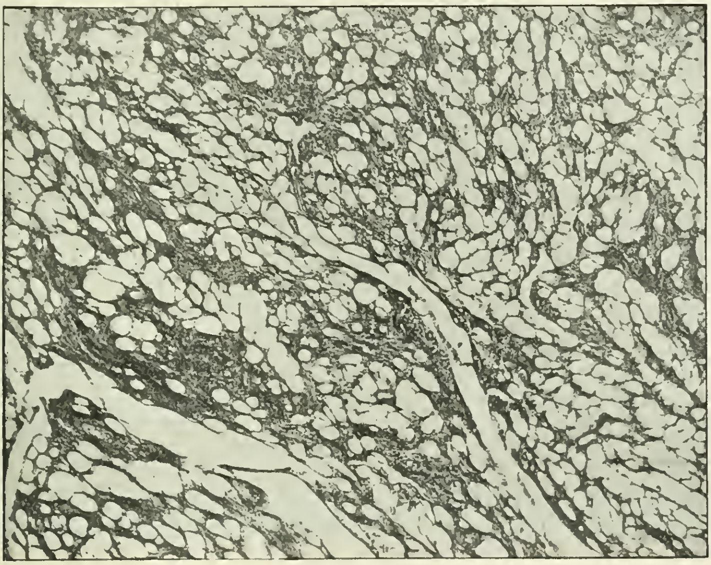


Fig. 1.

Lipomatosis of a fibromyoma of the corpus uteri. (× 27.)

Microscopic appearances: The sections stained with hæmatoxylin and eosin, and hæmatoxylin and Van Gieson, show a fibromuscular tissue consisting of narrow bundles of muscles separated by coarse strands of collagen fibre. This tissue is only seen in parts of the section. For the most part the section is made up of fat envelopes separated by narrow strands of collagen fibre, and occasionally broader strands of collagen fibre and muscle. The nuclei of the muscle cells are stained clearly throughout the section, and the muscle-fibres are uniform in size and shape. The collagenous stroma is, in parts, slightly œdematous. In the sections stained by Sudan III and hæmatoxylin, each fat envelope is seen to be filled by one large globule of fat. A flattened nucleus can be seen in the periphery of many of the envelopes. There are no granules or globules of fat in the cells of the tissue between the envelopes.

Remarks.—The macroscopic and microscopic appearances of the tumour are those of a fibromyoma containing fat. The fat is present in the form of large globules, each of which distends a cell. These cells are in the form of signet rings; the appearance of the fatty tissue being similar to that of normal lipomatous connective tissue. Fine granules of fat, such as are characteristic of fatty degeneration, are present neither in the muscle nor in the connective tissue cells, nor is there evidence of any other degeneration of the cell elements. There is, therefore, no evidence that the lipomatous tissue is an expression of fatty degeneration such as is frequently seen in degeneration of fibromyomata, especially in calcareous impregnation and in hæmorrhagic necrosis. The tumour is either a fibro-myo-lipoma or a fibromyoma

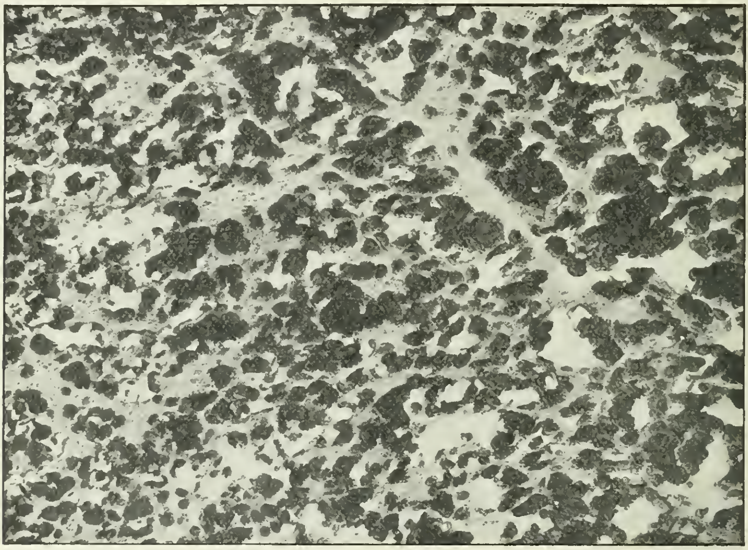


Fig. 2.

Lipomatosis of a fibromyoma of the corpus uteri; stained by Sudan III. (× 27.)

with fatty metamorphosis of the fibrous stroma. The absence of young fat granule cells, and more especially the distribution of the lipomatous tissue, are strongly in favour the latter interpretation.

The literature on this subject is extremely scanty, all authorities stating that fatty changes in fibromyomata are extremely uncommon. Only one other instance of this condition has come under my notice. This is now in the Museum of St. Bartholomew's Hospital. It was placed there by Sir James Paget. It consists of a pedunculated fibromyoma with a small, well-defined, encapsulated tumour embedded in the centre of its substance. It was removed from a woman, aged 50. Its growth had given rise to no trouble, but it suddenly protruded from the vagina during defæcation, and was therefore removed. I have not seen a microscopic section of this tumour, but Dr. Griffith tells me that it is a lipoma in a fibromyoma.

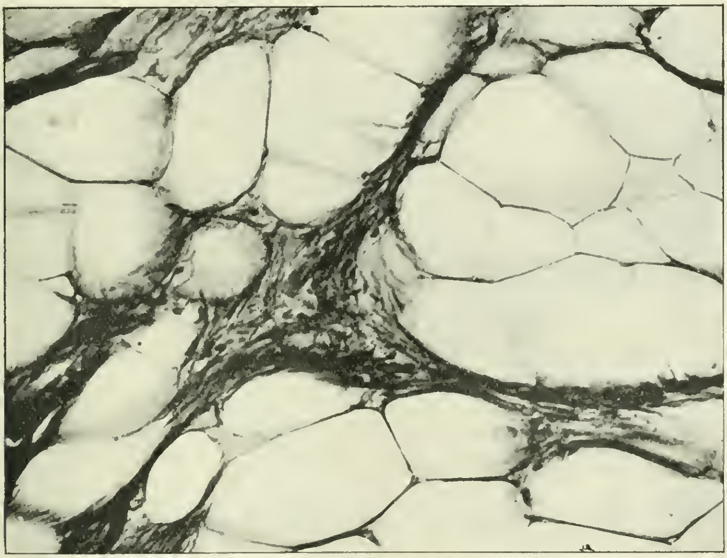


FIG. 3.

Lipomatosis of a fibromyoma of the corpus uteri. (× 215.)

My best thanks are due to Dr. Drummond Maxwell for permission to publish this case, to Dr. Hubert Turnbull, Director of the Pathological Institute of the London Hospital, for kind assistance, and to Dr. Griffith for his kindness in giving me particulars about the St. Bartholomew's Hospital specimen.

Case of Hæmatometra.

By H. Russell Andrews, M.D.

M. G. T., single, aged 22, was sent to me on account of primary amenorrhœa and abdominal pain. For eight years she had complained of acute abdominal pain occurring every month. On the last four occasions the pain had been sufficiently severe to make her stay in bed. She had recently had some difficulty in passing water. For a long time, she did not know exactly how long, there had been a tender swelling in the lower part of the abdomen. She was a healthy, well-developed girl. On abdominal examination a swelling was found reaching about 3 in. above the pubes. The external genitalia were normal. The vagina was not more than an inch long; there was no bulging at the top of it. On rectal examination a tense, cystic swelling, about the size of a large pear—apparently pyriform in shape—could be felt in the position of the uterus. No definite cervix could be felt. A diagnosis of hæmatometra was made. It was impossible to say whether a hæmatosalpinx was present or not. As I decided to open the abdomen rather than to treat the case by dissection from below, it was immaterial whether a hæmatosalpinx was present or not, so I did not examine her under an anæsthetic. When the abdomen was opened the uterus was found to be enlarged and tense, the size of a three to four months' pregnancy. On the left side were a hæmatosalpinx and a small ovarian cyst. The right tube and ovary were healthy. On handling the uterus some retained menstrual fluid was discharged from the ostium of the right tube, but there was no evidence of leakage having taken place before, such as I have seen in a somewhat similar case. The uterus was removed entire with the left ovary and tube, the right ovary being preserved. There was a good deal of difficulty in dissecting out the lower part of the tumour from the depths of the pelvis, and from the rectum, and in freeing it posteriorly a small hole was made into the rectum just reaching the mucous membrane. This was repaired with two layers of catgut purse-string sutures. The pelvic peritoneum was sewn over the raw surface, and the abdomen was closed in the usual way. The patient made an uninterrupted recovery.

After being hardened the uterus measured 5 in. in length, and the average breadth was 2 in. It had rather the shape of an hour-glass, having an upper and lower expansion separated by a constriction. At the lower end no trace could be seen of the external os. (It is difficult to explain why the uterus had not become much larger, as there was a history of abdominal pain for eight years, and there was no evidence that blood had escaped into the peritoneal cavity, unless it may be assumed that there had been leakage, but all the blood had been absorbed, and had not caused staining of the tissues. I have reported two cases[1] in which most of the contents of the abdomen were stained with blood which had regurgitated through the abdominal ostium of the tube. Unfortunately there was no note made as to the interval

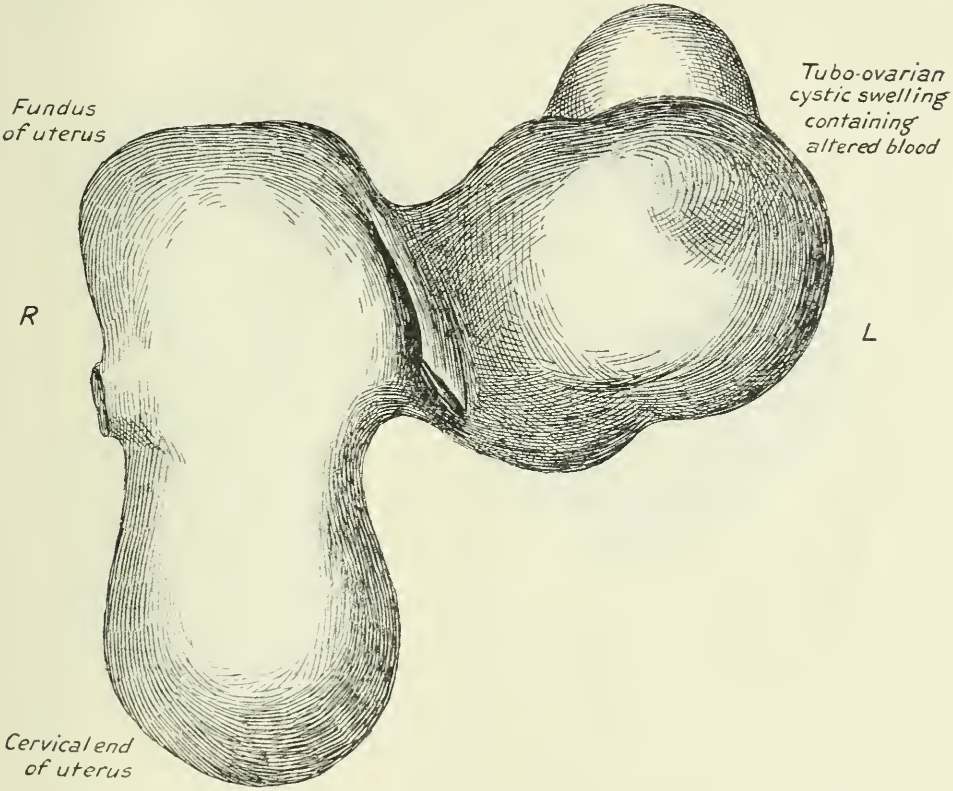


FIG. 1.

Hæmatometra with hæmatosalpinx. No trace could be found of the external os or the upper three-quarters of the vagina. (Two-thirds of actual size.)

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[1] *Journ. of Obstet. and Gyn.*, 1911, xix, p. 521.

between the last attack of pain and the operation.) On opening the uterus longitudinally after hardening it was found to contain the usual treacly fluid. There was a slight transverse ridge dividing the cavity into an upper and lower half, apparently representing the cavity of the body and the cervix respectively. The upper part was lined with a purple red membrane, not unlike the ordinary endometrium in appearance; the lining membrane of the lower part was pale. The wall was thin, measuring 0·7 cm. in the upper expansion. The membrane lining the upper expansion, the ridge and 1 cm. of the cavity below was rugose. Below this the lining was perfectly smooth.

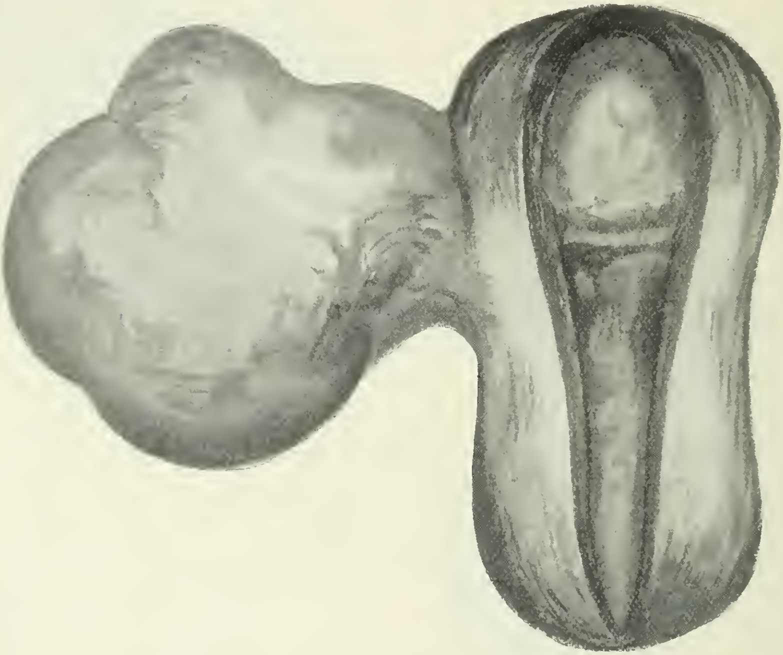

Fig. 2.

Hæmatometra with hæmatosalpinx. The uterus has been opened by an incision posteriorly. (Two-thirds of actual size.)

Microscopical sections are shown from (1) the upper expansion, (2) the contraction including the ridge, (3) the lower extremity of the lower expansion. (1) is lined by a glandular mucosa which has the characters of endometrium. (2) The muscular wall is thicker; the mucosa which lines the cavity above the ridge is narrower than in

(1), and contains fewer glandular tubules; below the ridge it is still narrower; it contains glandular tubules for some distance, but towards the extremity of the section farthest below the ridge there are no glandular tubes; the mucosa here is represented by a layer of columnar cells which are separated from the fibromuscular tissue of the wall by a very few fibrils and cells of the stroma. (3) The muscular wall of the lower expansion is about half the thickness of that of the upper. Its inner surface is lined by a single layer of cubical cells which rest upon a very narrow layer of mucosal stroma.

I thought that this specimen might be worth showing as it is rather an unusual one. My experience of hæmatometra due to a congenital occlusion or want of development of the vagina is not a large one. This is the only case that I have operated on myself where the whole uterus, body and cervix, was distended with blood, there being no trace of the upper part of the vagina. I have operated on two other cases of hæmatometra due to congenital occlusion. In one the upper third of the vagina was patent and distended; in the other the cavity of the body of the uterus alone was distended, the cervix being imperforate.

It seemed to me that as the uterus would be useless from the point of view of pregnancy, and there would be considerable difficulty in keeping patent a passage between the vaginal orifice and an artificial opening into the cervix, the best treatment was removal of the uterus with preservation of the healthy ovary. I have grafted the vagina in two cases of retention of menses due to occlusion of the middle third of the vagina, in one with skin-flaps and in the other with a flap of vaginal mucous membrane removed from another patient, with fairly satisfactory results, but in this case the vagina was totally wanting except for about an inch at the lower end, and the operation of grafting would have been extensive and difficult. I think that unless a patient who has been treated in this way will present herself for examination periodically, so that dilatation can be performed if necessary, there is a danger, even after grafting, that contraction may occur and lead to further retention of menses. A method of treatment which was formerly recommended—viz., the removal of the ovaries so as to bring menstruation to an end — does not deserve any consideration at the present day.

Chiefly concerning the Genito-mesenteric Fold of Peritoneum.

By Douglas G. Reid, M.B.

(1) *Peritoneal Connexions of the Terminal Part of the Ileum; Intestinal Flexures.*—Apart from the mesentery, the terminal part of the ileum may be connected to the abdominal wall by two different folds of peritoneum. One is the ileo-appendicular fold of Jonnesco (the "bloodless" fold of Treves), the other is the fold which I have described in the fœtus and named genito-mesenteric.[1] In such cases these folds must be carefully distinguished from one another. The fold of Treves may actually adhere to the genito-mesenteric fold. When it adheres to the abdominal wall the bloodless fold of Treves may help, along with the terminal part of the ileum, to bound a very definite fossa.[2] This was present in the fœtus shown in fig. 11; and I have now seen it well marked in a number of adult bodies. "In pericæcal hernia the bowel is thrust into one or other of the pouches met with in the region of the ileo-cæcal junction";[3] and without wishing to exaggerate the possibilities of such a fossa, I think it should be kept in mind as the possible seat of an internal hernia. Through the genito-mesenteric fold the ileum may be very closely bound to the right ovary and Fallopian tube, even closer than is shown in fig. 1. This connexion is not to be mistaken for a pathological adhesion; but the genito-mesenteric fold as a track along which infection, or inflammation, may spread to or from the ovary and Fallopian tube is to be kept specially in mind. In the third place, the terminal part of the ileum may be

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[1] See *Journ. of Anat. and Phys.*, 1908-9, xliii, p. 308; 1910-11, xlv, pp. 73, 406; 1911-12, xlvi, p. 239. This fold occurred in 55 per cent. of twenty 12 to 22 cm. (vertex to coccyx) fœtuses. I have found it in a great number of full-time fœtuses.

[2] For a photograph of this fossa, as seen in an adult, and for other photographs showing the genito-mesenteric, bloodless and root folds of peritoneum, &c., I must refer the reader to Professor Joseph Rilus Eastman's recent papers, "The Fœtal Peritoneal Folds of Jonnesco, Treves and Reid," and "Fœtal Peritoneal Folds." See *Surg., Gyn. and Obstet.*, April, 1913, and *Journ. Amer. Med. Assoc.*, 1913, lxi, p. 635. I hope shortly to have published in the *Journal of Anatomy* some more photographs of the genito-mesenteric fold. One shows the ileum and appendix *both* adhering to the fold, and forming flexures rendered permanent in this remarkable manner. Their lymph vessels were also thrown into immediate connexion.

[3] H. Alexis Thomson and A. Miles, "Manual of Surgery," Edinb., ii, 1911.

connected to the abdominal wall, not by a fold,[1] but by adhesions which bind it directly to the parietal peritoneum (*see* fig. 2). This is extremely common both in the fœtus and in the adult. In the adult the terminal part of the ileum almost always ascends from the pelvic cavity,[2] and the

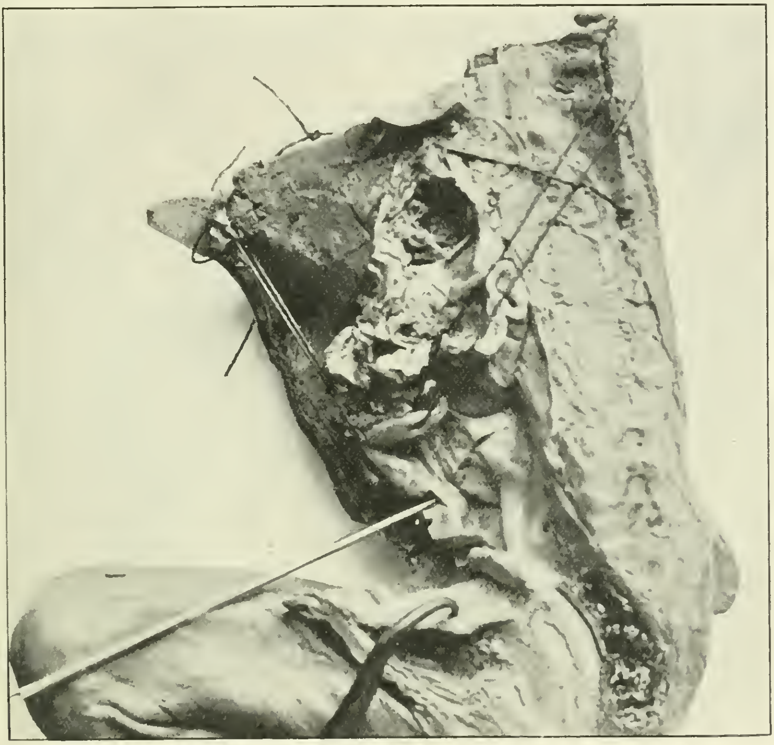

FIG. 1.

Sagittal section of a fœtus. The terminal part of the ileum is seen to be closely connected to the ovary (and Fallopian tube) by the genito-mesenteric fold (indicated by the needle) of peritoneum. The pelvic colon, which lay in contact with the fold, has been removed.

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[1] Provided the adhesions be not too diffuse, traction (as through the movements of the ileum) upon the connective tissue elements, where they have become continuous, tends to elongate them into a fold. In this way it is possible that, secondarily, a fold may be produced at the periphery of the adhesions.

[2] This must be remembered. For example, I have an almost exactly similar photograph to that given by Gray and Anderson as representing Lane's kink (see "Developmental Adhesions affecting the lower end of the Ileum and Colon," *The University Press*, Aberd., 1912, pl. iii); but the similarity in the cases could only be obtained by pulling the ileum upwards out of the pelvic cavity.

part of the ileum involved in adhesions generally extends from the pelvic brim to the cæcum, and usually takes a straight course (*see* fig. 2, A). But in one adult it presented a flexure *which was rendered permanent by these adhesions* (*see* fig. 2, B). In another adult the ileum, instead of ascending, descended to form an acute flexure with the part that was bound to the parietal peritoneum. But such a flexure (*see* fig. 2, C) could scarcely be regarded as being permanent, since the ileum was simply held up by coils of small intestine which had doubtless pushed it upwards out of the pelvic cavity. Therefore, we must carefully distinguish between flexures which are permanent and those which are most probably only temporary in nature. In the same way the ascending colon may be bent upon itself if its lower part remain "free" and be pushed upwards by coils of small intestine. It is in such cases

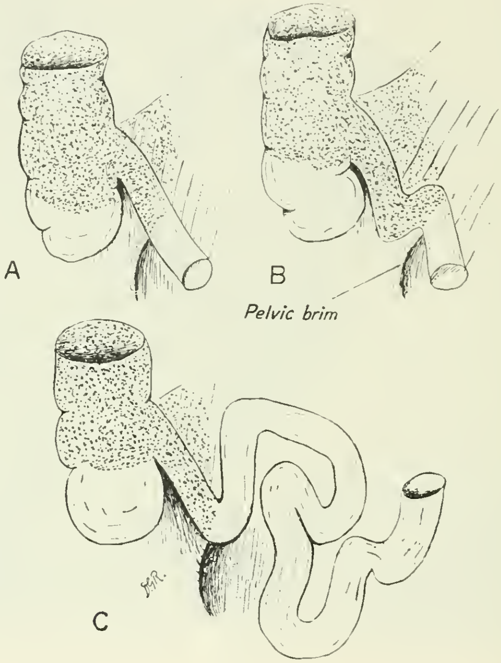

FIG. 2.

The stippling indicates the parts involved in adhesions.

that the surgeon may fail to find the cæcum in the right iliac fossa, although it can be pulled downwards into this.[1]

Various bends on the colon (*see* fig. 3), at first quite gentle curves, may become acute by movements which approximate the limbs of the loops. Thus a V-shaped loop may be formed on the transverse colon; and the pelvic colon (which in the fœtus often forms a large intra-abdominal loop whose summit ascends to the duodenum) may have its limbs squeezed together, as it were, and become "compressed" (*see* figs. 3 and 9). The transverse colon may then adhere to its own

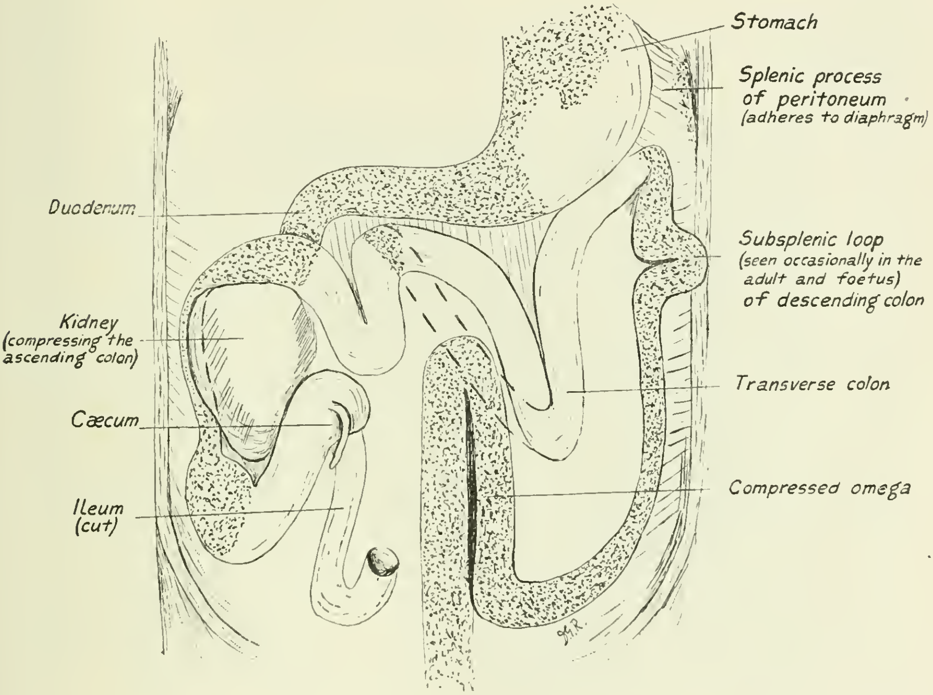
Stomach
Splenic process of peritoneum (adheres to diaphragm)
Duodenum
Subsplenic loop (seen occasionally in the adult and foetus) of descending colon
Kidney (compressing the ascending colon)
Transverse colon
Cæcum
Compressed omega
Ileum (cut)
M.R.

FIG. 3.

The stippling indicates the parts involved in adhesions. The splenic process is normally present in the adult as well as in the fœtus. Sometimes it adheres to the diaphragm so that the spleen lies in a very definite compartment closed in front, and sometimes below, by this fold.

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[1] In one such case the transverse colon occupied the right iliac fossa in place of the cæcum which it had doubtless helped to push upwards into contact with the liver and gall-bladder.

mesentery, and the pelvic colon, throughout its whole extent, to the parietal peritoneum. The latter may even adhere to the duodenum and to the mesentery of the small intestine. Such adhesions may cause these bends to become permanent, and many, as we are aware, seriously interfere with the functional activity of the bowel.[1]

(2) *The Genito-mesenteric Fold* appears after the fourth month of fœtal life. Its surfaces, which are right and left, are at first free as regards adhesions. It is not attached along indefinite lines. Primitively it is attached to the mesentery along the line of the ileac branch of the ileo-colic artery. Behind it is attached to the abdominal wall over the right spermatic or ovarian vessels, and sometimes over the right external iliac artery. Along its posterior border lie the spermatic plexus of nerves, or the ovarian nerves, and the right external spermatic nerve (genital branch of the genito-crural) and lymphatic vessels. I have been able to demonstrate the presence of lymphatic nodes in the genito-mesenteric fold; and this is doubtless an important point in view of its usual connexion below with the ovary and Fallopian tube, through the suspensory ligament (plica vascularis) of the ovary, and the possible spread of infection. In the male it is sometimes, but not usually, continuous with the suspensory ligament (plica vascularis) of the testis. I have noted that the great omentum may adhere to the ascending colon and cæcum,[2] and may pass from these to the parietal peritoneum; and in cases where the ascending colon remains "free," it is noteworthy that it might coat the right surface of the genito-mesenteric fold and carry on to it blood-vessels and lymphatic vessels. The connexion with the suspensory ligament of the genital gland explains how the genito-mesenteric fold may gain attachment to the peritoneum at the interval abdominal ring in full-time fœtuses and in the adult.

Permit me to draw your special attention to the fact that there is one main fold of peritoneum lying in the right half of the abdomen below the mesentery. It is the genito-mesenteric fold; and to it the ileum, the appendix, the meso-appendix, the cæcum and the "bloodless" fold of Treves may become adherent. In some cases it is probable that these secondary connexions may explain the presence of these parts in the sac of a right-sided congenital inguinal hernia. In an adult the free, sharp border of the genito-mesenteric fold was tightly stretched. Had small intestine crossed this edge to enter the patent processus vaginalis, or the tubular retrocolic fossa which was present, strangulation might readily have been produced. There are various ways in which the genito-mesenteric fold may complicate operations for removal of appendix.

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[1] I can well understand how such adhesions, as seen by me, might also cause considerable trouble in such operations as excision of the rectum by the sacral route and sigmoidostomy. Several years ago I dissected an adult in which the mesentery, at its root, had no attachment to the abdominal wall. It had fused down over the pelvic colon from which it took origin.

[2] *Journ. Anat. and Physiol.*, 1910-11, xlv, pp. 73-84.

It is very common for the meso-appendix to adhere to the genito-mesenteric fold (*see* fig. 4). This may occur in such a way that the appendicular artery comes to lie along the free border of the genito-mesenteric fold in which it appears to lie. The artery to the appendix may also be bound to the right surface of the genito-mesenteric fold. The appendix may also adhere, in a very firm manner, to the right surface of this peritoneal fold (*see* fig. 5), and through this be connected to the ovary and Fallopian tube. The genito-mesenteric fold can be exposed by pulling the small intestine forward. It may bound a

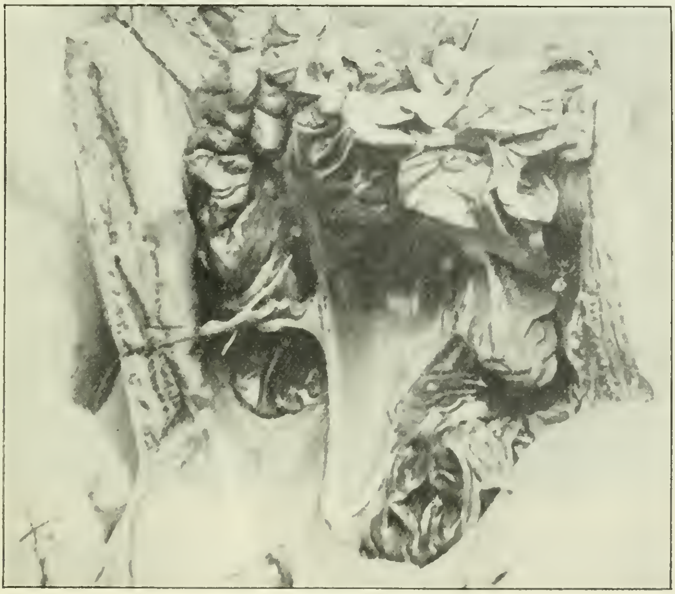

FIG. 4.

Full-time fœtus. The meso-appendix (the thin strip of white paper lies behind the vermiform appendix) adheres to the genito-mesenteric fold.

retrocolic fossa. Should the appendix lie in this and be bound to the genito-mesenteric fold, either directly or through the meso-appendix, any attempt to drag the appendix from the fossa would result in considerable laceration and tearing of peritoneum. In some cases free access to the appendix may be obtained by dividing the genito-mesenteric fold. If in an operation this be done for any reason, the relations of the fold to the appendix, and to blood-vessels (including the appendicular artery) and nerves, should be kept in mind.

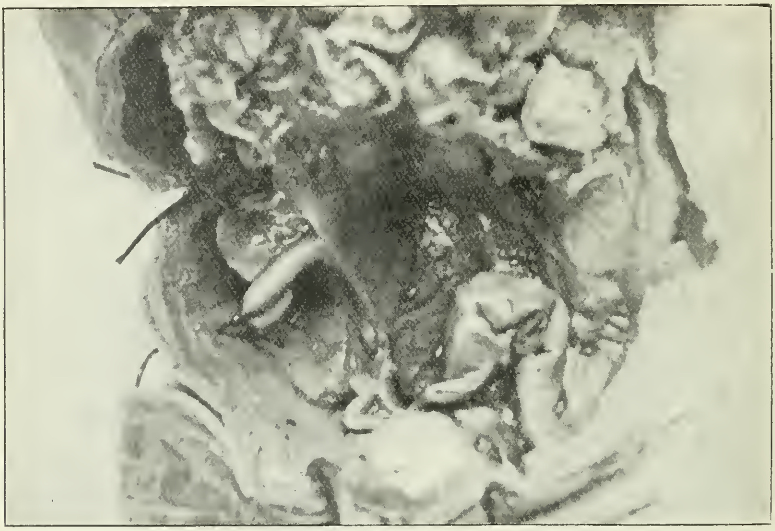

Fig. 5.

Fœtus, 15·5 cm. long, ♀. The appendix adheres very firmly to the genito-mesenteric fold.

In a fœtus 24 cm. long (*see* fig. 6) the right ovary and Fallopian tube were held in a vertical plane (on the left side the ovary and tube lay in a practically transverse plane, the plane both ovaries usually occupy in fœtuses of this length), and were bound, almost directly, to the under surface of the mesentery by an extremely short genito-mesenteric fold. This presented all its normal vascular relations. In addition to this, the appendix adhered very firmly to the right surface of the genito-mesenteric fold, and through this was bound, almost directly, to the ovary and Fallopian tube. This is not a pathological adhesion, but a connexion which, I think, must be of considerable interest, in view of the occurrence of appendicitis, or salpingo-ovaritis, and the spread of infection, or inflammation, from the appendix to the ovary or tube, or in the opposite direction.

(3) *The Action of the Genito-mesenteric Fold in producing Adhesions and in arresting the Completion of Cæcal Torsion.*—Primitively the mesentery is attached at its root to the posterior peritoneum along the line of the root-folds of peritoneum (*see* fig. 7).[1] The left or superior root-fold contains the ileo-colic vessels. The right or inferior root-fold is also known as the mesenterico-cæcal fold of Jonnesco. But the genito-mesenteric fold when it develops anchors, and indeed appears to exert a traction upon, the mesentery. I have shown that whenever a sheet or fold of peritoneum is rendered relatively immobile it tends to become still more immovable through the formation of adhesions. Thus in quite small fœtuses, where the parts were absolutely healthy,

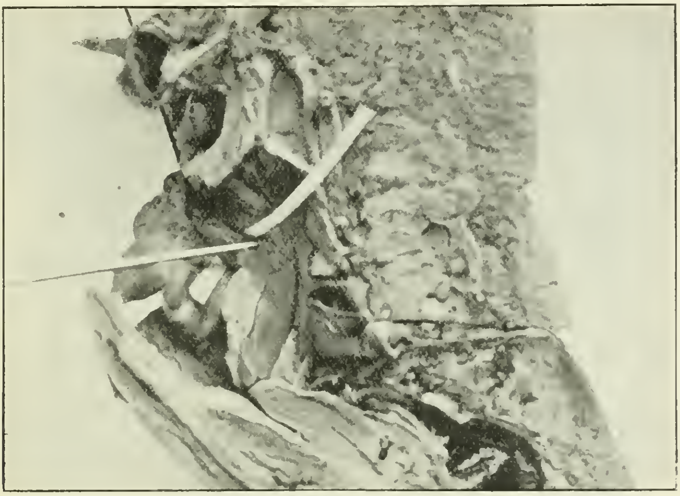

FIG. 6.

Sagittal section of a fœtus, 24 cm. long (vertex-coccygeal measurement). The right ovary and Fallopian tube lie in a vertical plane and are bound almost directly to the mesentery and to the appendix (this lies between the needle and the strip of white paper) by an extremely short genito-mesenteric fold (the needle indicates the anterior border of this fold).

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[1] For a photograph of these *see* Professor J. R. Eastman's paper in *Journ. Amer. Med. Assoc.*, Chicago, lxi, p. 635.

I have frequently found the most extensive adhesions associated with the genito-mesenteric fold. These are accurately represented in fig. 7. The ileum adheres to the right surface of the genito-mesenteric sheet. To the right of this it adheres, as does its mesentery, to the abdominal wall. The cæcum, appendix, meso-appendix, and fold of Treves all adhere to the parietal peritoneum. The appendix may be buried behind the ascending colon and cæcum fixed down by the most firm adhesions. These are not due to pathological causes, although they may become useful as ready-made barriers resisting the spread of inflammation, especially from the appendix. Even the most extensive adhesions, which the surgeon tries so carefully to deal with in operations, as for appendicitis, may be due to the operation during fœtal life of this genito-mesenteric fold. Furthermore, as a result of this anchoring or traction, the adhesions of the mesentery may extend to the left of the line of the genito-mesenteric fold (*see* fig. 7). In short, this fold may lower the root of the mesentery, whilst the cæcum is still placed high up in front of the right kidney, and whilst the root-folds are still practically transverse in direction.

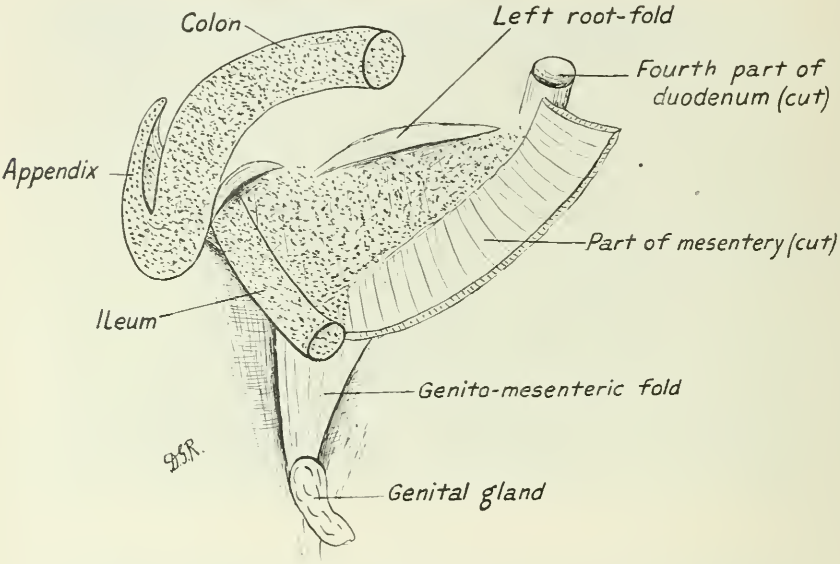

FIG. 7.

The parts involved in adhesions are indicated by the stippling.

The fœtus shown in fig. 8 presents some of these adhesions. The ileum adheres to the abdominal wall as does the cæcum, part of the appendix, the meso-appendix, and the bloodless fold of Treves. The adhesions which involve the ileum always involve it to the right, and never to the left, of the genito-mesenteric fold (*see* fig. 8). Apart from enlargement or prolapse of the liver or stomach, it is possible that in some cases this fold may be a cause of a downward displacement of the duodenum. It is noteworthy that it is always to the lowest part of the duodenum that this fold is attached; and it is this part which may sometimes be found lying definitely in the right iliac fossa.

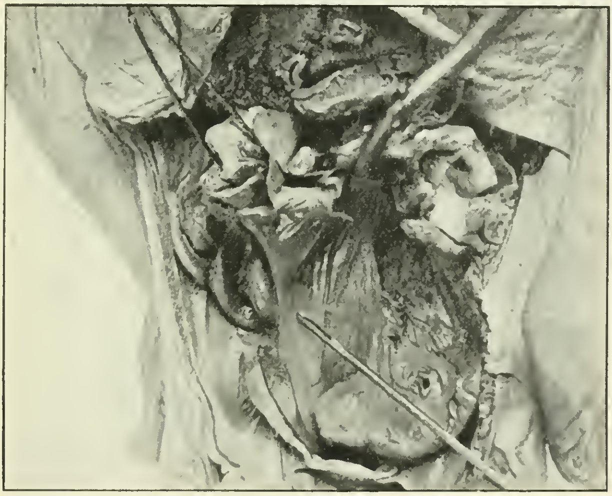

FIG. 8.

Fœtus, 17 cm. long. The perforated end of the needle rests on the left surface of the genito-mesenteric fold. There are strong adhesions in the ileo-cæcal region.

The genito-mesenteric fold may not be the only cause of adhesions in the ileo-cæcal region and fixation of the cæcum and appendix. Firm pressure upon these parts by a meconium-distended pelvic colon may cause them to adhere to the abdominal wall over an area which in extent equals the surface upon which the pressure was exerted. In this way the appendix may also become bound directly to the under (left) surface of the mesentery.

The statement that *two normal endothelial surfaces can adhere to one another* does not express a theory but a truth.[1] Similarly the pelvic colon, by pressing on the genito-mesenteric fold may cause it to adhere to the abdominal wall (*see* fig. 9). This partly explains how this fold is not so common in the adult as in the fœtus. The continuity of the fold with the plica vascularis may be broken in this way. This is

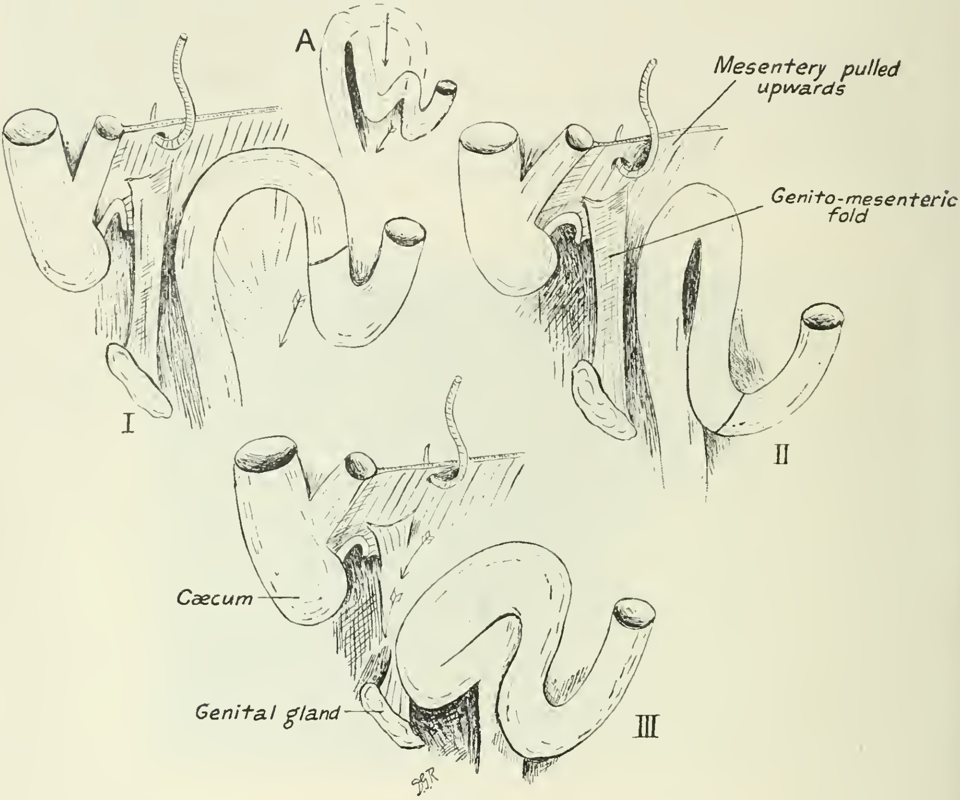

Fig. 9.

In II there is a *compressed omega-shaped* intra-abdominal loop of pelvic colon. In this case it has been formed through the descent of a portion of the left limb of the *primitive omega-shaped* loop of pelvic colon seen in I. In III a *compressed and incompletely inverted omega* loop has been formed through the summit of the compressed omega gliding downwards through an arc of a circle. In this movement it has pressed upon the genito-mesenteric fold and caused it to adhere to the parietal peritoneum.

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[1] I have found evidences for this in almost every fœtus I have examined.

what had occurred in the fœtus shown in fig. 10.[1] It was, of course, impossible to tell if there had been any obliteration of the lymphatic vessels. But, at all events, a track along which inflammation itself may possibly spread has been interrupted.

Variations in the position and relations of the appendix, which are brought about through the arrest of cæcal torsion at various stages, must be of interest to the surgeon. Fig. 11 shows a very early stage of cæcal torsion, for the concavity of the cæcum is directed to the right as well as upwards. A rotation of the cæcum "through an arc of 180°"

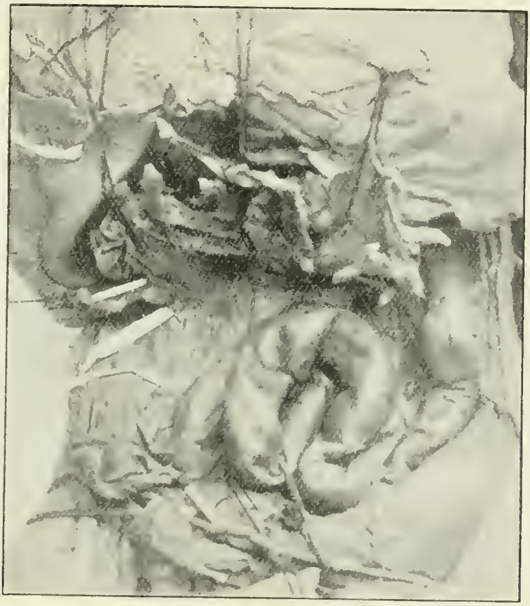

FIG. 10.

The two upper strips of white paper lie, one above and the other below the appendix. They indicate the remains of the genito-mesenteric fold. The lower strip of paper rests on the head of the epididymis and points to the free edge of the plica vascularis. To expose this the *incompletely inverted omega* has been pulled a little forwards.

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[1] It is noteworthy that in this fœtus, as in many other specimens, the appendix is connected to the mesentery by a fold of peritoneum formed by the fusion together of the meso-appendix and the genito-mesenteric fold. For this reason the appendicular artery projects from the right surface of the fold.

is necessary before the completion of cæcal torsion.[1] The large appendix of the fœtus lies in front of the short ascending colon, and the cæcum is placed in front of the right kidney. But the bloodless fold of Treves adheres to the abdominal wall. This adhesion may resist, prevent, or at all events assist in preventing, the completion of cæcal torsion. The terminal part of the ileum, for example, also adheres to the abdominal wall in this specimen; and this adhesion would also resist the completion of cæcal torsion.

I have already referred to the genito-mesenteric fold as a cause of adhesions involving the ileum and other parts in the ileo-cæcal region. The fold of Treves may be enormously stretched consequent upon this adhesion and the descent of the cæcum. At the more advanced stage of torsion shown in fig. 12 the appendix forms a loop which lies quite on the right side of the colon and cæcum and intervenes between these and the lateral abdominal wall; and at the stage shown in fig. 13 the appendix lies in a plane behind the ascending colon. This is the position

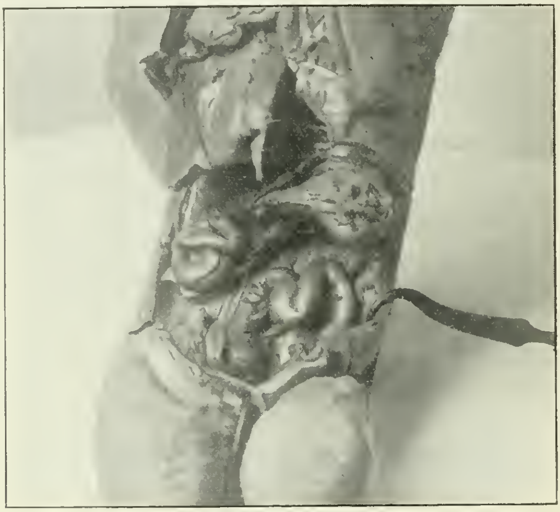

Fig. 11.

Fœtus, 22 cm. long. Early stage of cæcal torsion. Note that the bloodless fold of Treves adheres to the abdominal wall.

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[1] This stage of cæcal torsion has been well described by Huntington in his book on the peritoneum.

it usually occupies in fœtuses in which the cæcum has descended to below the right kidney. The appendix ascends to the kidney and is then bent downwards. It thus accomodates itself to the space available below the prominent fœtal kidney. Now, or after only a little more torsion, the appendix is brought into contact with the right surface of the genito-mesenteric fold, or into contact with the adhesions produced in association with this (*see* fig. 8). It is obstructed in its passage inwards and may always remain in a retrocolic position. *It may also now adhere to the genito-mesenteric fold and through it be connected to the genital gland. The genito-mesenteric fold is the commonest cause of a retrocolic position of the appendix.*

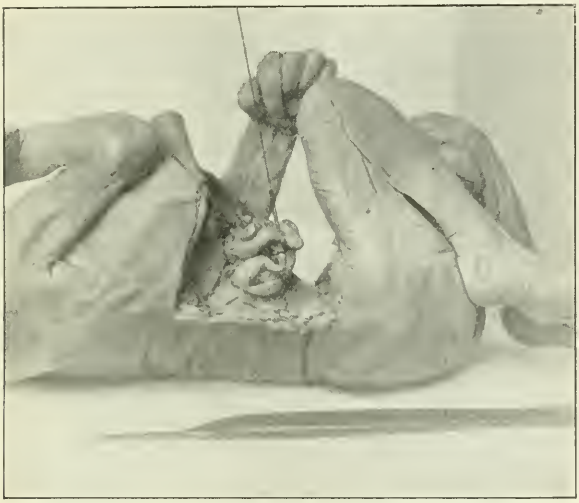

Fig. 12.

Fœtus, 20 cm. long. More advanced stage of cæcal torsion. The genito-mesenteric fold is present.

(4) *Jackson's Membrane.*—I have shown that the parieto-colic fold of Jonnesco may be formed in the fœtus by a fold of peritoneum which crosses in front of the ascending colon and may contain blood-vessels, which are visible macroscopically, and course towards the parietal peritoneum. It may also be formed by a fold (appendix epiploica) which arises from the front of the ascending colon and becomes adherent to the lateral abdominal wall. We have already noted that the great

omentum may adhere to the ascending colon and cæcum and pass from these to the abdominal wall. I have seen such a sheet, formed by the points in relation to the origin of Jackson's veil apart from pathological fusion of the laminæ of the great omentum, in two adults. In one the right part of the transverse colon was closely bound to the ascending colon by the great omentum which crossed between them. It was Professor Eastman, of Indianapolis, who drew special attention to these causes. In reference to this membrane he also points out, that following upon the adhesion of the bloodless fold of Treves to which I have drawn attention, the cæcum, during its descent and during cæcal torsion, may wrap itself up in this fold. At all events, this fold may form "a sconce from which in adults the caput coli must occasionally be shelled out."

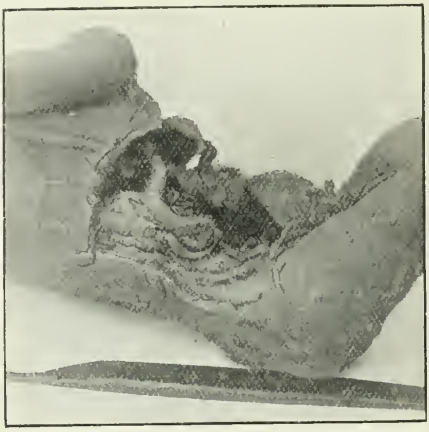

Fig. 13.

Fœtus, 17 cm. long. Still more advanced stage of cæcal torsion.

(5) There are many other remarkable adhesions. Many are, doubtless, of importance in helping to fix and support the viscera, and some may become of interest to the surgeon. I found that adhesions had begun to be formed even in an embryo 25 mm. long. Fig. 14 shows that the duodenum and head of the pancreas can adhere completely to the abdominal wall only after the caudate lobe (process) of the liver has retracted from a recess in which it lies behind these viscera. Note

how the posterior surface of the head of the pancreas is left exposed. I have traced the development of this recess, and have found it present in full-time fœtuses. A persistent recess would be an interesting condition to find in an adult. It is noteworthy that in adult bodies one can readily get one's fingers behind the head of the pancreas and separate it up from the abdominal wall. The postero-inferior surface of the fœtal stomach forms adhesions with the parts behind it. These adhesions may subdivide the lesser sac of peritoneum into two parts which may fail to communicate with one another, or may only communicate through a small foramen (*see* fig. 15). This may be termed *the supra-adhesion foramen* since it lies above, and is determined by the normally developed adhesions binding the stomach to the transverse meso-colon. I have frequently found small supra-adhesion foramina in adults. Owing to these adhesions, and the associated fusion together

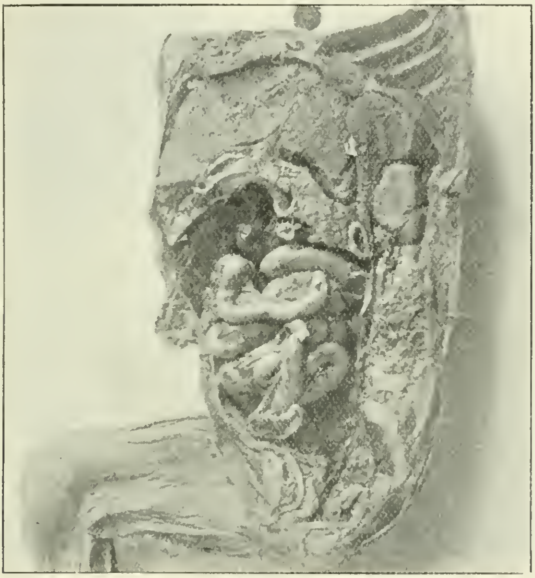

FIG. 14.

The retro-pancreatico-duodenal recess in a 17-cm. fœtus. In front of the right suprarenal body the caudate lobe (process) of the liver is seen lying in the recess.

of the laminæ of the great omentum, the surgeon, should he desire to open through the gastrocolic omentum[1] into that portion of the lesser sac that lies behind the stomach, should make his incision in the neighbourhood of the spleen even in a young child. These adhesions, together with others, subdivide the abdomen into compartments or recesses. These in some cases may form, as it were, definite ready-made "abscess cavities." I have found the great omentum very useful in forming these abscess cavities.[2] It might be interesting to consider the ways in which the genito-mesenteric fold may assist or prevent the spread of inflammation from one part to another. We have seen that it determines adhesions which may "bury" the appendix behind the

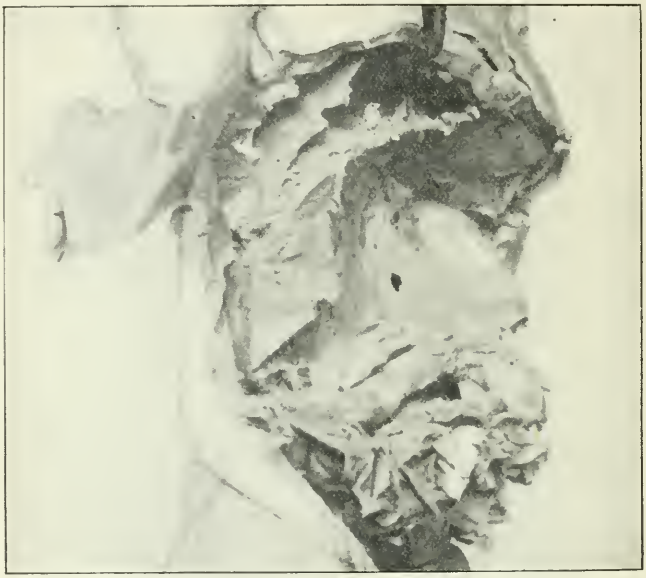

FIG. 15.

Fœtus, 19 cm. long, viewed somewhat from the right side. In relation to the stomach the *supra-adhesion foramen* is seen. To expose it a large part of the liver and the gastro-hepatic omentum have been removed.

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[1] In operations for gastric ulcer Treves ("A Manual of Operative Surgery," 1909, i, p. 220) has advised the gastro-hepatic route.

[2] *See* fig. 11 of my paper in *Journ. of Anat. and Physiol.*, 1913, xlvii, p. 506.

colon. Apart from creating these barriers resisting the spread of inflammation, it may also act as a track along which infection, or inflammation, can spread to or from the ovary and Fallopian tube. The lymphatics in the fold may in some cases be of considerable importance in association with this spread.

Recent papers, especially by Dr. Macnaughton-Jones,[1] have dealt with this subject; and the special purpose of this paper is to lay before you some of the anatomical truths of the ileo-cæcal region as I know them.

DISCUSSION.

Dr. MACNAUGHTON-JONES said that as the President had stated, he had included in his address to the Section in 1911 Dr. Reid's description of the genito-mesenteric fold and its relations to the ovary as well as to the appendix. The relations of this fold to the appendix, and also to the mesentery, ileum, and cæcum, have a most important bearing on the spread or arrest of inflammation from the appendix to the pelvic structures, or from the latter to the appendix. Since then Dr. Reid had made many further important investigations into the relations of the peritoneal folds and bands to the intestines in the fœtus, as also to the appendix and the pelvic structures. The permanency of such folds or bands explains many of the pathological conditions found in adult life, as, for instance, retrocæcal abscess, the presence of the appendix in hernial sacs, and the appendical complications in affections of the adnexa. No one had thrown so much light on these fœtal peritoneal relations as Dr. Reid. The Section was much indebted to him for the extremely interesting demonstration which he had just given.

Professor WATERSTON considered that Dr. Reid had given satisfactory evidence of the existence, in a certain proportion of cases, of the genito-mesenteric fold. He suggested that further information as to its significance might be obtained by microscopical examination, as it seemed possible that the fold might be due to a band of muscular tissue resembling the gubernaculum testis. He appealed to the members of the Section for specimens of embryos at all stages of development, and promised that good use would be made of any material sent to him, either fresh or immersed in 5 per cent. formalin solution.

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[1] See *Proc. Roy. Soc. Med.*, 1911, iv (Obstet. Sect.), p. 346, and *Med. Press and Circ.*, 1912, n.s., xciv, p. 601, and 1913, n.s., xcv, p. 196.

Dr. REID stated that he had explained the origin of certain folds of peritoneum as the result of adhesion and traction. Professor Eastman seemed to have given a somewhat similar explanation of the origin of the genito-mesenteric fold. Its origin was extremely difficult to explain, and especially its relation to the ileac branch of the ileo-colic artery. Any view expressed must take this into consideration as well as the late origin of the fold (after the fourth month), otherwise it might be discounted. He implied that he might undertake a further research into the fold. It was difficult to obtain embryos, and for the study of the lymphatics especially it was necessary to have "fresh" material. At present it was impossible to give them any more information regarding the genito-mesenteric fold.

Obstetrical and Gynæcological Section.

February 5, 1914.

Dr. W. S. A. GRIFFITH, President of the Section, in the Chair.

A Fibroma of the Hymen.

By HERBERT R. SPENCER, M.D.

THE tumour measured 1½ in. by 1 in. and weighed 6 dr. It had been noticed for only six or eight weeks by the patient, who was aged 28, married, but *virgo intacta*. The tumour was not painful, but smarted at times. Menstruation began at the age of 15, was regular every four weeks and lasted four days. There was a history of cancer on the mother's side.

The patient was a thin, rather pale and nervous woman with a full-sized pelvis, but small breasts. In the vulva was found a rounded tumour looking like a fibroid polypus of the size of a pigeon's egg and ulcerated on the surface. It was pedunculated, and on drawing the tumour away from the vulva it was found that the right side of the hymen formed the pedicle of the tumour. The hymen itself was intact, annular in shape, and barely admitted the tip of the forefinger. On either side of the meatus was a little crypt, the supposed termination of Gartner's duct. The orifice of the left Bartholin's gland was seen between the base of the hymen and the left labium (fig. 1). The position of the orifice of the right Bartholin's gland (fig. 2) showed that the tumour grew from the right side of the hymen throughout its whole length.

The tumour was removed by snipping through the hymen near its attachment; the hymen and fourchette were then divided in the middle line sagittally and sewn up coronally so as to enlarge the orifice.

The tumour is covered with stratified epithelium and beneath this by a thin layer of connective tissue from which it is sharply demarcated. It has the structure of a very cellular fibroma. There is a good deal of degeneration and vacuolation present, and the walls of the numerous vessels have undergone hyaline degeneration and the cells of the wall and its lining are swollen.

Simple tumours of the hymen, with the exception of cysts, appear to be very rare. I know of no record of a fibroma. As to the origin, I do not think it is congenital, the congenital nodules, thickenings and tags often met with occurring, as far as I know, in the middle line. Nor is it likely to have developed from a hæmatoma (which I have seen as a result of rape) in view of the fact that the hymen was unruptured.

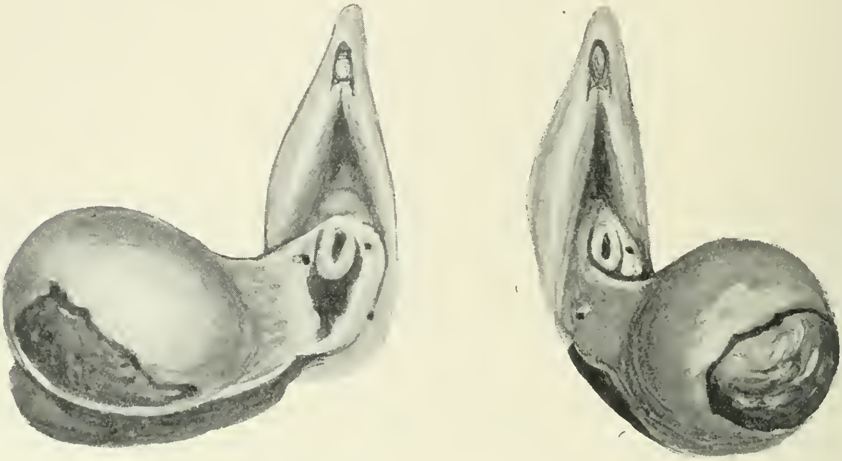


Fig. 1. Fig. 2.

Fibroma of the hymen. Two sketches by the author, taken just before removal of tumour. The tumour lay in front of the vaginal orifice. It has been pulled forward and to the side to show the relations.

I heard recently from the patient's mother that her daughter remains well nearly three and three-quarter years after the operation.

Mr. Clifford White said he had seen a small solid tumour of the hymen in a new-born child. It measured $\frac{1}{4}$ in. in diameter and had a small pedicle, as in Dr. Herbert Spencer's specimen. It grew from the right side of the hymen and was easily removed by holding it with forceps and cutting through its pedicle. As it had been crushed by holding it in the forceps, and as he did not at the time realize its rarity, he did not cut sections, and therefore he regretted he was unable to state absolutely that it was a fibroma, although it had the appearance of one macroscopically.

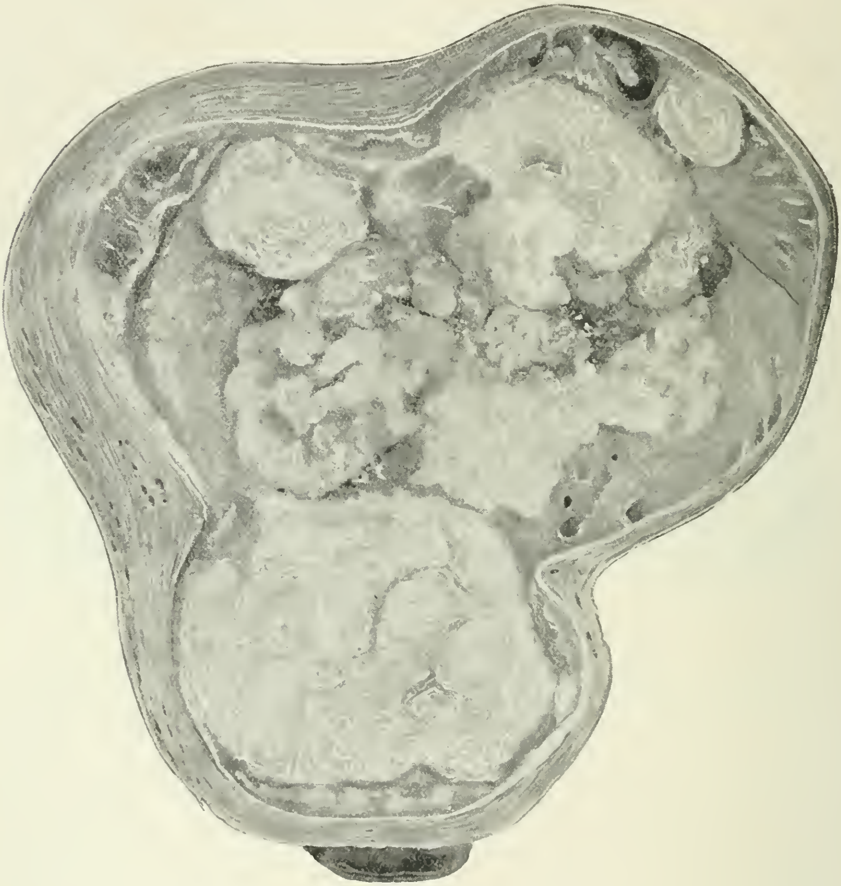
Degenerated Myomatous Uterus resembling the Pregnant Organ.

By Herbert R. Spencer, M.D.

The uterus, which measured 10 in. by 8½ in. by 5 in. and weighed 7¾ lb., was removed by total abdominal hysterectomy on July 31, 1913, from a virgin, aged 43, who made a simple recovery. The patient had only noticed the tumour for seven months, but had had a sense of fullness in the abdomen, and a vaginal discharge of long standing which had been yellowish for three years: only a week ago had she found it necessary to consult a doctor. Headache and pain in the back, about a week before the periods, had occurred for some time. Menstruation began at the age of 12, was always regular in time and quantity, occurring every twenty-five to twenty-eight days, lasting six to seven days, requiring seventeen diapers and being painless.

The abdomen was distended by a somewhat cordate tumour which rose up for 10 in. above the pelvis and measured 12 in. across; the girth 2 in. below the umbilicus was 35¾ in. The tumour fluctuated and varied in consistence in different parts, was freely movable, and appeared to be distinct from the uterus (examined *per rectum*). As the hymen was intact and small a sound was not passed. It was diagnosed as a multilocular ovarian cyst. At the operation, which was performed in the presence of several distinguished foreign gynæcologists attending the International Medical Congress, the tumour was found to be uterine, and in outline, colour and feel closely resembled the pregnant organ. I pointed out the bulging anterior lower segment, which I believe never occurs in pregnancy except when complicated with retroflexion or fibroids. This did not quite convince the onlookers, one of whom said he thought the uterus was pregnant, even after examining the removed organ; another said he would like to see it opened; and when I said that I purposed hardening it first, he gave me a smile of some significance.

The hardened uterus, divided almost in the sagittal plane, is now exhibited. It shows a remarkable resemblance to the pregnant organ, in that four masses of myoma, roughly resembling the head, body and limbs of a fœtus, are found embedded in gelatinous material resulting from degeneration. This gelatinous material gave rise to the most perfect fluctuation (which I have met with in many similar cases) and one can easily imagine that, with further liquefaction of the surrounding jelly, ballottement might be obtained. This is not the first time I have mistaken a degenerated myoma for a multilocular cyst in a virgin for want of passing the sound; the inconvenience and painfulness of which in a virgin justify its omission, as both conditions equally demand operation. It was the bulging of the lower segment and the absence of ballottement which led me to diagnose degenerated myoma after opening the abdomen. This specimen shows that even ballottement may be possible. This sign I have never found in any tumour except



Degenerated myomatous uterus resembling the pregnant organ.

the pregnant uterus, though Sir John Williams told me that he once found it caused by a solid mass floating in an ovarian cyst.

I am inclined to think that the bulging of the lower segment is of value in distinguishing the myomatous uterus from the pregnant organ. It was present in a case, already brought before the Section, in which a 7-lb. tumour was removed from a virgin, aged 22. In that case a white patch, produced by the rubbing of the tumour against the promontory, was also present and aided the differential diagnosis.

DISCUSSION.

Dr. EARDLEY HOLLAND said he had once removed a fibroid uterus which, besides resembling the pregnant uterus in shape and consistency, gave on direct palpation the physical sign of "ballottement." So remarkable was the resemblance that it needed considerable courage to proceed with the operation ; but there appeared to be other overwhelming evidence against the possibility of the uterus being pregnant. The uterus, after being hardened in formalin was bisected and was seen to consist of a single large fibroid, encapsulated by the thinned uterine wall and divided up into a number of smaller round tumours by wide spaces filled with a lymph-like fluid. It was these smaller tumours which gave the sensation of "ballottement." In view of Dr. Herbert Spencer's remarks on "ballottement" in tumours, Dr. Holland would bring this specimen before the Section.

Dr. WILLIAMSON said he was surprised to find that Dr. Spencer laid so much stress upon the advisability of the passage of the uterine sound in cases of this nature. It was perfectly true that in many instances the uterine cavity was lengthened in cases of uterine fibromyomata and was of normal length in cases of ovarian tumours. To this rule, however, there were many exceptions. Very large fibromyomata might grow in the wall of the uterus without producing any lengthening of the uterine cavity, and, on the other hand, retroperitoneal ovarian tumours and parovarian cysts often led to stretching and elongation of the uterine cavity. He did not think that the sound possessed so great a diagnostic value as Dr. Spencer had implied, and because its passage was attended with some slight risk of septic infection or of trauma, and sometimes with pain, he was in the habit of teaching that the uterine sound was an instrument whose use was called for only rarely.

Dr. AMAND ROUTH was glad that Dr. Spencer had alluded to the diagnostic value of the difference between the local anterior bulging of a fibroid in the lower segment of the uterus and the slight general uniform bulging of the early pregnant uterus causing the well-known sign of "anterior vaginal roof-stretching."

Dr. Briggs had several times observed that a soft œdema around a centrally firm fibroid was physically complete for "ballottement."

Dr. Herbert Spencer thought the term "ballottement" should be limited to the sign obtained from a mass floating *in a tumour*. He had never obtained this sign except in pregnancy. He was very interested to hear of Dr. Holland's case, which he hoped would be published. With regard to the passage of the sound, he had alluded to it as a valuable means of distinguishing between a large multilocular ovarian cyst and a large uterus with degenerated myomata. His remarks did not refer to the differential diagnosis of cervical myomata or parovarian cysts, which latter, by the way, in the speaker's experience, did not greatly lengthen the uterine cavity.

Uterine Fibroids; one impacted in the Pelvis obstructing Delivery; Cæsarean Hysterectomy.

By T. G. Stevens, M.D.

Mrs. A., aged 33. First seen by Dr. Stevens on March 7, 1913. She had been married five years, and had had no pregnancy. She had previously seen Dr. C. G. Mack, of Highbury, who found that she had several fibroid tumours in the uterus. The menstruation was regular, lasting three or four days every four weeks, and the loss was not excessive.

On examination, it was found that there was a fibroid the size of an orange, low down on the posterior surface of the uterus, just above the vaginal vault, and more than one smaller than this near the fundus. The cervical fibroid was very fixed, and could not be pushed up above the pelvic brim. As there were no symptoms from these tumours except sterility, there seemed to be no immediate necessity for any operative treatment. Further, it transpired that for some reason coitus had been very infrequent, perhaps only on six occasions in five years. Thus, it rather seemed that the patient had had very few chances of becoming pregnant.

The patient was very anxious to have a child, and was willing to undergo any operation in the event of becoming pregnant. (It seemed unlikely that delivery *per vias naturales* could be accomplished owing to the impacted fibroid.) Dr. Stevens therefore suggested that nothing should be done for the present, but that the patient should lead a more normal sexual life, with more frequent coitus. The effect of this advice was startling, for the patient only had one more menstrual period, on April 1, and became pregnant immediately after.

Dr. Stevens again saw her on June 3, and found that the uterus was considerably enlarged. There had been morning sickness and some micturition disturbance. The cervical fibroid was as before, and quite fixed. All the symptoms pointed to a pregnancy of about two months, and it was decided that the patient should go to the full term, if possible, and then undergo Cæsarean section and removal of the tumour or uterus, as might be found to be necessary.

The pregnancy proceeded quite normally, and when seen again on December 9, in the eighth month, the cervical fibroid was larger and softer, and quite fixed, and two other fibroids could be felt near the fundus. It was quite clear that normal delivery was impossible, so it was arranged that the patient should be admitted to the Memorial Hospital, Mildmay Park, for operation on January 8, when it was judged that the full term would be reached. Dr. Stevens performed Cæsarean section on that date, first eventrating the uterus, to see whether it would be possible to remove the tumours by myomectomy without removal of the uterus. It was found that the supposed cervical fibroid was really in the lower part of the uterine body, and was not truly cervical, and consequently came up out of the pelvis when the uterus was drawn out. The uterus was very distorted, and the expansion due to the pregnancy had occurred at the expense of the anterior wall, the posterior being occupied by the large fibroid. It was at once seen that myomectomy would necessitate several, probably four, incisions in the uterus, as well as the Cæsarean section wound, and even if the tumours could be enucleated, the uterus would be left in a much mutilated condition, and probably a dangerous organ to leave. It was therefore decided to do a supravaginal hysterectomy after first extracting the child by the usual anterior incision. The operation presented no difficulties, and was completed in the usual manner.

The patient stood the operation well, and was put back to bed with a pulse of 74. For the first three days the condition of the patient gave some anxiety, as she had abdominal distension. There was some vomiting on the second and third day, and the pulse rose to 136. However, with pituitrin, strychnine and purgatives the bowels acted, and the pulse gradually came down to 88 on the seventh day. On the eighth day, at 2 p.m., the patient began to complain of abdominal pain and sick feelings, with a rising pulse. By 6 p.m. the pulse was 142, weak and irregular. There was great tenderness in the right iliac fossa, and the question of a possible appendicitis arose. At the same time there was no definite evidence of peritonitis. Then the patient suddenly vomited 36 oz. of brownish fluid. There were no indications for any operation, and the patient was in such a collapsed condition that any interference seemed out of the question. Pituitrin was given hypodermically, and a mustard and linseed poultice was applied to the abdomen. The wound was quite healed, the Michel's clips having been previously removed. On the next day, the ninth, the patient was more comfortable, and the pulse was falling in frequency. A mixture of Epsom salts and strychnine was ordered to be given three times a day. On the tenth and eleventh days the patient was comfortable, the pulse 76 to 84, but the bowels were constipated. On the twelfth day the patient remained comfortable until 10 p.m., when she again had acute epigastric pains, vomited 50 oz. of fluid, and became collapsed, with a weak and irregular pulse of 146. There had been no action of the bowels that day. After this the patient gradually improved, began to take more food, and made a good recovery.

Remarks.—The two attacks of pain, vomiting and collapse in this case are unusual, and presented considerable difficulties in diagnosis at the time. The only place, at the first attack, where there was abdominal tenderness was in the right iliac region, and this was not at any time the acute tenderness of peritonitis, and the general appearance of the patient did not suggest this. Also there was no evidence of internal hæmorrhage at any time, nor was there any real evidence of intestinal obstruction. Fortunately, the patient was able to relieve her own symptoms by the two acts of vomiting, relatively, very large quantities of fluid. This suggests that the condition was really one of acute dilatation of the stomach, to a moderate degree only. So that the organ was not quite paralysed, but was still able to hold its contents. The collapse, especially at the first attack, was very severe, and perhaps ought to have given some indication of the true nature of the condition. Fortunately, in a sense, the vomiting occurred before the collapse was extreme, so that restorative remedies were able to act to advantage.

Eclampsia ; Vaginal Cæsarean Section.

By T. G. Stevens, M.D.

Mrs. A. M. P., aged 27, primigravida, in the twenty-fourth week of pregnancy, was admitted to Queen Charlotte's Hospital at 6 p.m. on January 7, 1914. The history was that the patient had a fit at 5 p.m. the day before, and became unconscious. She had fits every hour through the night, and also at 10 a.m. and 3 p.m. on the day of admission. She remained unconscious throughout.

On admission the patient was quite unconscious. A catheter was passed and a very small quantity of urine was drawn off, half solid with albumin on boiling. The top of the fundus uteri was at the level of the umbilicus, the vertex was presenting. There was no evidence of uterine contractions. On vaginal examination the cervix was found to be long and rigid, the external os admitting the finger-tip, the internal os quite closed. There were no fits after admission. Seeing that the patient had been unconscious from 5 p.m. on January 6 until 8 p.m. on January 7, Dr. Stevens determined that rapid delivery was indicated, and thought that vaginal Cæsarean section offered the quickest and safest means of accomplishing this.

The operation presented no difficulties. The vaginal mucous membrane was incised transversely at the junction of the cervix and vagina, the bladder was stripped off the uterus until the peritoneal reflexion was reached, and then the peritoneum was further stripped up. This enabled an incision to be made in the mid-line from the os uteri about 3 in. long, reaching 1 in. above the internal os. The edges of the incision were pulled down progressively with tenaculum forceps. The membranes were then ruptured. The fœtal head was seized with sponge forceps and easily delivered. The placenta gave no difficulty, and very little bleeding occurred from first to last. The incision in the uterus was stitched with six interrupted catgut sutures, the vaginal mucous membrane was replaced with a continuous suture. No packing was used either in the uterus or vagina.

The patient showed no evil effects from the operation, during which a pint of saline solution was given subcutaneously. The coma gradually lessened after the operation, and on the day following the patient could be roused sufficiently to drink. The patient became conscious on the third morning, and then made an uninterrupted recovery. The urine was very variable after delivery, on January 13 containing no albumin, but on January 20 and 21 there was a faint cloud on boiling. When examined on the fourteenth day the vaginal incision and the cervix were healed completely. The os uteri looked a little ragged, as the tenacula during the operation had torn out once or twice.

Remarks.—Although this operation proved easy, quick and safe, Dr. Stevens considered that it had a very limited application. He would not think of performing it after about the thirtieth week of pregnancy, if there was a chance of delivering a living child. The safety of the operation depended upon the size of the child to be delivered, and Dr. Stevens considered that there would be considerable difficulty in delivering a living child after the thirtieth week without risk of tearing the uterus, if the cervix were quite undilated as in this case. The chief difficulty of the operation lies in getting a sufficient incision in the uterus to enable the child to be delivered without risk of injury to the uterus or bladder.

Cæsarean Section; Labour obstructed by One Half of a Uterus Didelphys.

By T. G. Stevens, M.D.

Mrs. E. A., aged 20, was admitted to Queen Charlotte's Hospital on account of obstructed labour due to a pelvic tumour on January 6, 1914. This was a second pregnancy, the first having terminated normally in the Kensington Infirmary in 1910.

The patient had been in labour several hours, and on examination the fœtus was found to be lying in the left occipito-anterior position, the head was mostly above the brim of the pelvis but was not freely movable. The child was alive, the fœtal heart sounds were good and did not suggest any fœtal distress. *Per vaginam*, the os uteri was three-quarters dilated, the membranes were ruptured, and the lips of the os were œdematous, especially the posterior. The fœtal head could just be reached and felt fixed; it could not be pushed up by any safe amount of pressure. A moderately soft, elastic mass could be felt behind the cervix, bulging the posterior vaginal wall forwards below the fœtal head, occupying about half the pelvic cavity and firmly fixed between the fœtal head and the promontory of the sacrum. This mass was immovable, and in consistence suggested a dermoid cyst of the ovary under pressure. It was quite clear that it could not be pushed up so as to allow the fœtal head to come down, the two being so firmly locked between the promontory and the symphysis pubis. A provisional diagnosis of labour obstructed by an ovarian cyst was made, and Cæsarean section was decided upon. This was at once carried out, the usual median incision being made. The placenta was in front and was removed first, after having separated it by a sweep of the hand introduced. The child was delivered with some difficulty as the head was locked in the brim by the tumour. The uterus was then brought outside the abdomen and the incision was at once sutured with interrupted silk sutures. The obstructing mass was then investigated, and when brought up from below the promontory was found to be one half of a double uterus with its Fallopian tube and round ligament complete. Until this moment it had not been noted that the incised "uterus" had only one Fallopian tube and round ligament. The unimpregnated half was about the size of a tennis ball, but rather more elongated, it was very freely movable, and the tissues at its junction with the impregnated half were very œdematous and difficult to differentiate. The Fallopian tube and round ligament in each half had become somewhat displaced to the side, much more so in the impregnated half. As the patient had already gone through one normal delivery, it was decided to leave the double uterus alone, recognizing that if the patient again became pregnant, the unimpregnated half must be pushed up above the brim out of harm's way during the first four months. The abdomen was then closed in three layers, catgut being used for the aponeurosis.

The patient made an uninterrupted recovery, and passed a complete decidual cast of the unimpregnated half on the third day. This specimen is on the table and a section of it has been placed under the microscope. It was at first thought that this was a uterus bicornis unicollis, as only one os uteri was noted before the operation. When, however, the patient was examined at the end of a fortnight it was found that there were two separate cervical portions, and also a distinct ridge was seen on the anterior and posterior vaginal walls, suggesting that there had originally been a complete vaginal septum. From these appearances it seems highly probable that the condition is really a uterus didelphys.

Remarks.—The treatment adopted here is open to criticism, as it may be considered that the tumour could have been pulled up out of the pelvis if the uterus had been drawn out of the abdomen before delivery by Cæsarean section, in which case delivery could have been left to Nature, especially as the patient had already had a child without difficulty. Dr. Stevens considered that this was impracticable owing to the manner in which the tumour, uterus and fœtal head were locked in the pelvic brim. Had the attempt been made it seems highly probable that some damage would have been done, owing to the œdematous and softened condition of all the tissues of the obstructing mass. It was therefore considered safer to empty the uterus by incision before investigating the nature of the obstructing tumour.

DISCUSSION.

The PRESIDENT (Dr. W. S. A. Griffith) congratulated Dr. Stevens on the successful results of his three cases, and was sure his method of treatment in each would be approved. He, however, would not describe the second case of vaginal hysterotomy as one of Cæsarean section. This case was a typical one for this operation, an operation which he had also found invaluable for the examination of the interior of the body of the uterus when he had grave reason to suspect *early* malignant disease there. By this means it was not difficult to see the whole extent of the cavity and to remove for examination any suspicious fragment, which a curetting might easily miss.

Dr. BRIGGS remarked that in a vaginal hysterotomy the transverse preliminary incision to separate the bladder from the uterus was an unnecessary complication, and that the one central vertical incision by a probe-pointed bistoury from within the uterus downwards and forwards through the cervix into the vagina could be made without damage to the empty bladder; the advantage had been realized during the last fifteen years' experience in operative obstetrics and gynæcology.

Dr. HERBERT SPENCER said that wounds of the cervix and lower segment made in "vaginal Cæsarean section," when bruised by dragging a large fœtus through it, did not always heal by first intention. He had seen a very wide gap left in the cervix in a case where the operator was very confident at the time that union would take place. He did not think that the term "Cæsarean section" should be applied when the child was not viable. He could confirm what Dr. Briggs said as to the superiority of simply cutting through the cervix in early cases of pregnancy where it was necessary to incise; but did not think the method applicable to a case at the twenty-fourth week. If he might make a suggestion on such a successful case, perhaps dilatation by Bossi's dilator sufficient to permit version (which could be performed in a few minutes without risk) and subsequent natural delivery of the child would have been better than "vaginal Cæsarean section."

Dr. BARRIS said that there had recently been a large number of cases of Cæsarean section in the Maternity Department of St. Bartholomew's Hospital. One of these was similar to the third case recorded by Dr. Stevens. She was a patient, aged 38, a primigravida. The fibroid gave rise to no abnormal symptoms during pregnancy. It was the size of a man's fist and was situated in the lower uterine segment in its left and posterior aspect. It lay entirely within the true pelvis and could not be pushed up above the pelvic brim. Cæsarean section was performed at full term before the patient was actually in labour, in order to avoid damage to the fibroid from pressure. The child was born alive. The uterine wall was closed, the muscle by silkworm gut and the peritoneum over this by catgut, and the uterus was not removed. The uterus was not removed because the tumour had given rise to no symptoms, it did not prevent pregnancy, and in the event of the present child dying there was the chance of a further pregnancy. The tumour itself was not removed because it was too diffuse, and its removal would have necessitated removal of the uterus. Dr. Barris agreed with the treatment adopted by Dr. Stevens in his particular case.

A Case of Congenital Sacro-coccygeal Tumour.

By J. PRESTON MAXWELL, F.R.C.S., and GORDON LEY, F.R.C.S.

THIS specimen was removed by Mr. Preston Maxwell in the Hospital at Yung Chung, China, on December 16, 1912.

Mr. Preston Maxwell has given the following history: The patient was an under-sized girl, aged 16. She was admitted to the hospital on November 23, 1912. Since birth a large mass had been observed in her left buttock. In later years this mass had made sitting extremely difficult. Since the age of 3 sinuses had existed in the gluteal cleft and these had continuously discharged a thin sebaceous secretion. The bowels had always acted regularly. The patient had never menstruated. On December 2 she was placed under chloroform for examination. The left gluteal region was occupied by a large tumour, which had deep connexions behind the rectum; the latter, however, was not involved. The uterus and vagina appeared to be normal. The upper part of the tumour could just be reached by the fingers sunk into Douglas's pouch from the anterior abdominal wall. In the wall of the tumour, and fairly superficial, was a large mass of bone resembling the half of a lower jaw.

On December 16 she was again placed under chloroform, and an incision approximately 8 in. in length was made from the upper part of the coccyx on the left side, to the lowest point of the tumour. With considerable difficulty a large tumour was separated from its surrounding tissues. Its main vascular connexions were at the end nearest the coccyx and, close to this bone, a cavity was opened which appeared to be lined with peritoneum and to have a loop of large intestine free in it. The muscular bands on the intestine were quite distinct. As by this time the patient was showing signs of severe shock, and as the connexions of this bowel were not clear, it was left behind and the remainder of the tumour removed. The operation lasted about one hour and a quarter. No connexion was found between the sinuses in the gluteal cleft and the tumour. The tumour on being opened was found to contain a rudimentary hand, a mass of tissue of doubtful nature with a broad pedicle, putty-like material, pieces of shed nails, and a little hair. On the left side of the coccyx was a small swelling with thick walls containing an opalescent fluid. This was cut away as far as possible, but its walls were very firmly adherent to the coccyx. Evidently the loop of bowel left behind had been damaged, for a quantity of irritating, fæcal-smelling fluid was discharged from the

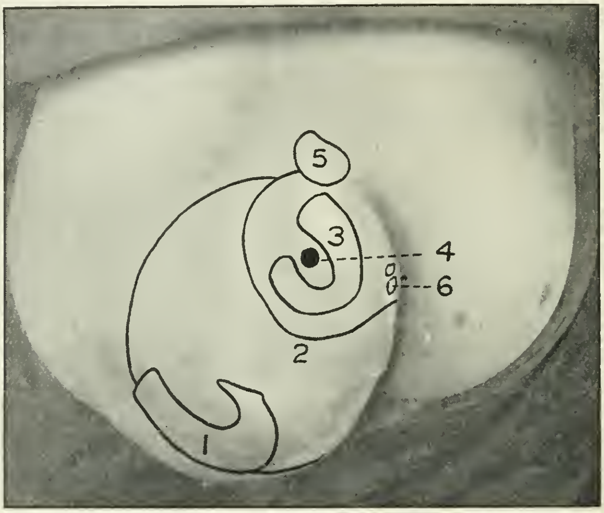


Fig. 1.

(1) Position of bone resembling lower jaw. (2) Position of cavity containing bowel. (3) Position of loop of bowel. (4) Main blood supply to tumour. (5) Thick-walled cyst containing opalescent fluid. (6) Position of sinuses discharging sebaceous material.

wound, and later the patient had an attack of inflammation of this bowel with the discharge of a quantity of mucus. Her own bowels acted regularly and there was no sign of their involvement. Two attempts were made to close the sinus which led to this bowel, but they were unsuccessful. On March 31, 1913, the whole of the loop of bowel was removed, after opening up the old wound. The loop was laid open to insure certainty as to connexions; it had no connexion with the patient's intestines. The pedicle lay in front of the coccyx at the level of the sacro-coccygeal junction. After this operation the patient made a steady and satisfactory recovery. The gluteal sinuses healed, and she left hospital on April 26, 1913.

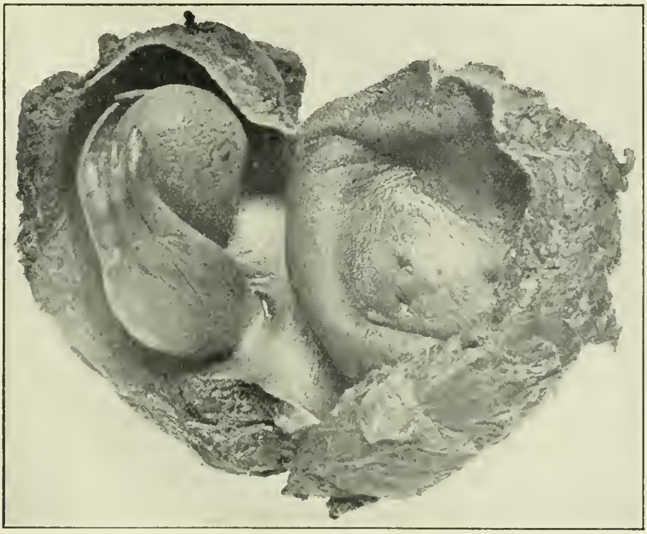


Fig. 2.

Photograph of the specimen.

Macroscopic Appearances.—Two specimens, (*a*) and (*b*). (*a*) The specimen is a cyst, 14 cm. in diameter. It has been cut open, so as to expose the cavity. The cavity is 10 cm. in diameter. Into the cavity project two structures. One of these is a pear-shaped mass, 6 cm. long and 5 cm. in its broadest and thickest diameters. The second structure arises 2 cm. from the first. It is 7 cm. long, and resembles a hand with 3 fingers, 5, 4, and 4 cm. long respectively. This cavity is lined, and the two structures are covered by a coarse skin. From the skin project hairs. The majority of these hairs are downy and apparently colourless; there are also tufts of black hairs, the longest of which measure 9 cm. The pear-shaped projection is found on section to consist of lipomatous tissue beneath its covering of skin. The hand has a rough, hairy surface corresponding to the dorsum, and a smooth, hairless palmar surface. The fingers have each three phalanges, and are furnished with long, curved nails. The wall of the cyst varies in thickness from 0·5 to 2·5 cm. It consists of lipomatous tissue. In the segment of the wall from which the projections arise there are three bones. At the base of the hand is a long bone, which has a hammer-like extremity. Close to this, but not articulating with it, are two flat bones which articulate with one another. The smaller of these is bent in the centre at a right angle and at the convexity of the bend has a projection. The extremity which articulates with the third bone is expanded and triangular in shape. The third bone is the largest, being 10 cm. long, 3 cm. broad, and about 0·3 cm. thick. At the articulating extremity is a projection 2·3 cm. long and 1·2 cm. broad. This gives the bone the appearance of a rib. The second bone also bears some resemblance to a rib. No suggestion can be made as to the nature of the bone at the base of the hand. The outer surface of the cyst is covered by a layer of fibrous tissue, except over an area 7 cm. across. This area marks the site at which the specimen (*b*) was said to be attached; it lies immediately to one side of the area occupied by bones.

(*b*) The specimen is a semilunar mass, measuring 8 cm. by 5 cm. by 5 cm. It consists for the most part of fibro-lipomatous tissue. On the convex border there is a cleft, the margins of which are covered by squamous epithelium. The cleft leads into a winding tube, lined by mucous membrane. At one extremity of the semilunar mass is a small portion of bone, 1 cm. by 0·5 cm. A section shows that the squamous epithelium at the margin of the cleft lies on a fibrous dermis, whilst the mucous membrane of the tube lies upon submucous and muscular coats. The cleft is evidently the point at which an intestinal tube opens on to a surface, covered by skin. The outer margins of the area covered by skin have been been cut by a knife. The skin has certainly not been excised from cyst (*a*). It has evidently been excised from the separate cavity, which Mr. Preston Maxwell thought was lined by peritoneum. The portion of bone is, doubtless, a portion of the patient's coccyx.

X-ray photographs show that the fingers each contain three phalanges, and that three metacarpal bones are present.

Microscopic Appearances.—Portions were taken for microscopical examination from (1) the intestinal tube at its opening into the cleft, (2) the wall of the cyst, (3) the pear-shaped projection. Sections were stained by Ehrlich's hæmatoxylin and eosin, and by Weigert's iron hæmatoxylin and van Gieson. Section 1: The section passes across one side of the opening of the intestinal tube into the cleft. It shows, at one end, a narrow layer of flattened epithelial cells and, beyond this, a stratified epithelium. Beneath this there is a fibrous dermis which has well-developed papillary processes. This dermis contains sweat-glands and one hair-follicle. Subjacent to the dermis is a fatty connective tissue containing blood-vessels and nerve-bundles. On following the epithelial surface the stratified epithelium is replaced by a narrow layer of degenerated, flattened epithelial cells, and this in turn gives way to a mucous membrane, the surface layers of which are necrotic. This mucosa resembles that of the large intestine. It contains gland tubes and lymphoid nodules. There is a well-marked muscularis mucosæ, beneath which there are also lymphoid nodules. Subjacent to this muscularis mucosæ there is a broad zone of fatty tissue and beneath this there are two layers of involuntary muscle, the inner circular and the outer longitudinal. Beneath the muscular coats is a mass of fibro-lipomatous tissue containing two lymphatic glands. Section 2: The wall of the cyst. The inner surface is lined by squamous epithelium which shows horny, granular and basal strata. Subjacent to the epithelium is a dense fibrous dermis with papillary processes; this dermis contains erector pilæ muscle, hair-follicles, sebaceous glands, and numerous sweat-glands. Beneath the dermis is a mass of lipomatous tissue. Sections of the pear-shaped process resemble those of the wall of the cyst in all respects.

Remarks.—Specimen (*a*) is a cyst lined by skin. A hand, with three metacarpal bones and three phalanges, and a pear-shaped mass of lipomatous tissue projects into it. The wall of the cyst consists of lipomatous tissue. In the wall are three bones, one of which is connected with the hand. In specimen (*b*) there is a portion of large intestine which opens on to a surface covered by skin. This skin has not been excised from cyst (*a*); it has evidently been excised from the second, smooth-walled cyst described by Mr. Preston Maxwell. Cyst (*a*) and the cyst from which specimen (*b*) was derived were in close proximity, but there was no continuity between their cavities. The tumour therefore contained two independent dermoid cysts: these were embedded in lipomatous tissue, within which were bones. The tumour lay in the left gluteal region, and was attached to the anterior surface of the patient's coccyx. The tumour contained derivatives of epiblast, mesoblast and hypoblast; it is, therefore, a teratoma. The origin of such a tumour might be ascribed to (1) an included twin derived from one of the two primary germinal blastomeres, or (2) to a totipotential cell derived from post-primary blastomeres. (These totipotential cells are discussed fully in Adami's "Principles of Pathology.") The inclusion of a twin at any point save along the great anterior fissure is rendered impossible by the attachment of the amnion to the edges of this fissure. Inasmuch, therefore, as the tumour in this case lies behind the anus it is not an included twin. The tumour, therefore, appears to have arisen from a totipotential cell of a later origin than those giving rise to monochorial twins. Such a cell in the coccygeal region might be either an aberrant germinal blastomere or a cell of the posterior growing point; there is no evidence that totipotential cells are derived from the neurenteric canal. The posterior growing point is situated at the termination of the notochord—that is, in the perineal region behind the anus. The sacro-coccygeal region is a site of election for teratomata. It is difficult to explain the predilection for this site if the origin of these teratomata is ascribed to aberrant germinal blastomeres. The predilection is adequately explained if their derivation is ascribed to a cell of the posterior growing point. Additional evidence of the latter origin is afforded in the present case by the attachment of the tumour to the coccyx. It may be concluded, therefore, that the tumour is a teratoma derived from a totipotential cell of the posterior growing point.

My best thanks are due to Dr. Drummond Maxwell for bringing this specimen to my notice, and to Dr. Hubert Turnbull, Director of the Pathological Institute of the London Hospital, for his extremely kind assistance in the preparation of the pathological report.

Uncontrollable Uterine Hæmorrhage: A Report on 104 Uteri after Hysterectomy.

By HENRY BRIGGS, F.R.C.S., and R. A. HENDRY, M.D.

IN the Gynæcological Laboratory of the University of Liverpool during the twelve and a quarter years, April, 1901, to July, 1913, this collection was made. During the past three years Dr. R. A. Hendry has been almost exclusively occupied in the investigation now reported.

TABLE A.—THE AGES OF THE PATIENTS.

	Cases		Years
Division I	10		28 to 35
Division II	81	8	36 ,, 40
		28	41 ,, 45
		37	46 ,, 50
		8	51 ,, 55 (delayed climacteric)

In the combined Divisions I and II, average age 44·1 years.

Division III (post-climacteric onset of bleeding):—

	Cases		Years
	13	9	50 to 55
		4	61 ,, 72

TABLE B.—THE POSITION OF THE UTERUS.

Divisions I and II:—

51	normal
8	backward displacement with minor prolapse
18	minor prolapse, for which perineorrhaphy was added to the hysterectomy
14	major prolapse
Total 91	

Division III:—

1	retroverted
1	prolapsed
11	normal
Total 13	

TABLE C.—THE WEIGHT OF THE UTERUS.

Divisions I and II:—

72	uterus alone, average 4·6 oz. (maximum, 10 oz.; minimum, 2·5 oz.)
14	uterus with one or both appendages, average 5·8 oz. (maximum, 13 oz.; minimum, 2 oz.)
5	body of uterus, average 5·3 oz. (sub-total hysterectomy) (maximum, 12·75 oz.; minimum, 3·5 oz.)
Total 91	

Division III (post-climacteric):—

13	uterus alone, average 2·8 oz. (maximum, 8 oz.; minimum, 1 oz.)

TABLE D.—THE SIZE OF THE UTERUS.

External Measurements.

		In.		In.
Division I ...	average length,	3·4 ...	average depth,	1·7
	maximum ,,	4·25 ...	maximum ,,	2
	minimum ,,	2·75 ...	minimum ,,	1·5
Division II ...	average ,,	3·72 ...	average ,,	1·8
	maximum ,,	5 ...	maximum ,,	3
	minimum ,,	3 ...	minimum ,,	1·75
Division III ...	average ,,	3·2 ...	—	
	maximum ,,	4·5 ...	maximum ,,	2
	minimum ,,	2·375 ...	minimum ,,	0·75

TABLE E.—THE HÆMORRHAGE.

Its Extent and Relation to the Patients' Ages.

Divisions I and II :—

14	(*a*) 7/21 or less	average age	41
24	(*b*) over 7/21	,,	43·9
39	(*c*) metrorrhagia at least one month ...	,,	45·2
14	(*d*) "menorrhagia," periods not stated ...	,,	44·9

Note.—(*a*), (*b*) and (*c*) in order of severity; (*d*) uncertain.

TABLE F.—THE HÆMORRHAGE.

Its Mode of Onset.

In Divisions I and II the records reveal—

(1) In 72 a gradually increased menstrual duration; a menorrhagia over an average of 4 years (the maximum 25 years; the minimum 6 months); a corresponding reduction in the menstrual interval (in 20 of the 72 a continuous loss or metrorrhagia from 4 weeks to 12 months)

(2) In 19 a sudden onset of severe or moderate flooding followed by alternating irregular periods of amenorrhœa and hæmorrhage (average duration, 7 months; maximum, 16 months; minimum, 3 weeks)

In Division III sudden onset :—

4	severe
9	slight

TABLE G.—THE ONSET OF THE HÆMORRHAGE.

Its Puerperal Relations.

Divisions I and II :—

	8	bleeding followed pregnancy
	2	,, ,, unproved pregnancy (early abortion?)
	13	no pregnancies
	42	no ascribed relation to pregnancy
	26	not stated
Total	91	

Division III :—

13 cases—no relation to pregnancy

TABLE H.—THE ENDOMETRIUM.

Its Thickness.

Divisions I and II :—

21	not thickened—under $\frac{1}{10}$ in.
57	thickened—over $\frac{1}{10}$ in.
9	stalked adenoma ; 8 amidst thickened endometrium
4	sessile adenoma ; 2 ,, ,, 1 an additional stalked adenoma
Total 91	

Division III (post-climacteric) :—

5	not thickened
1	thickened
6	stalked adenoma amidst thickened endometrium
1	sessile ,, ,, ,,
Total 13	

TABLE I.—THE THICKNESS OF THE ENDOMETRIUM.

Its Relation to the Total Duration of the Hæmorrhage.

Divisions I and II (*see* Tables F and H) :—

		Duration of hæmorrhage						
(*a*) 72	Endometrium	Under 1 year	1-2 years	2-3 years	3-4 years	4-5 years	Over 5 years	Not definitely stated
16	not thickened ...	3	5	1	0	0	4	3
45	thickened ...	7	15	2	4	1	12	4
8	stalked adenoma	3	0	0	2	0	1	2
3	sessile ,,	0	1	1	0	0	0	1
		13	21	4	6	1	17	10

(*b*) 19		
5	not thickened	2, 3, 8, 12, 17 months
12	thickened	3 weeks, 3, 3, 4, 4, 5, 6, 7, 8, 12, 12, 12 months
1	stalked adenoma amidst thickened endometrium	16 months
1	sessile adenoma ...	6 months
91		

Division III :—

13	Endometrium	Duration of hæmorrhage
5	not thickened	2, 7, 9, 11, 12 months
1	thickened	Two attacks, 3 months ago and also 10 days ago
6	stalked adenoma ...	3 weeks ; 3 weeks ; 3 months ; 18 months ; *7 years, 1 year, 2 months ; *10 years, $1\frac{2}{3}$ years, 1 week
1	sessile adenoma amidst thickened endometrium	12 months
13		

---

* Three of the most marked hæmorrhages in the same patient.

TABLE J.—THE THICKNESS OF THE ENDOMETRIUM.

Its Relation to the Severity of the Hæmorrhage.

Divisions I and II (*see* Tables E and H) :—

(*a*)	14	7/21 and under... ...	endometrium not thickened	4
			endometrium thickened ...	10
(*b*)	24	over 7/21	endometrium not thickened	6
			endometrium thickened ...	11
			stalked adenoma amidst thickened endometrium except one	6
			sessile adenoma	1
(*c*)	39	metrorrhagia	endometrium not thickened	7
			endometrium thickened ...	28
			stalked adenoma amidst thickened endometrium...	2
			sessile adenoma amidst not thickened endometrium...	2
(*d*)	14	"menorrhagia" duration not stated	endometrium not thickened	4
			endometrium thickened ...	8
			stalked adenoma amidst thickened endometrium...	1
			sessile adenoma amidst thickened endometrium...	1
Total	91			

Division III :—

	9	slight	endometrium not thickened	4
			endometrium thickened ...	1
			stalked adenoma amidst thickened endometrium...	4
	4	severe	endometrium not thickened	1
			stalked adenoma amidst thickened endometrium...	2
			sessile adenoma amidst thickened endometrium...	1
Total	13			

TABLE K.—THE PARITY.

Divisions I and II (*see* Table F) :—

(1) In 72		average pregnancies	4·4
		,, children	3·8
	65 married ...	,, pregnancies	4·9
		,, children	4·2
	7 single ...	nulliparæ	
(2) In 19		average pregnancies	6
		,, children	4·9
	18 married ...	,, pregnancies	6·3
		,, children ...	5·2
	1 single ...	nullipara	
Total 91	83 married* ...	average pregnancies	5·2
		,, children	4·4
	8 single ...	nulliparæ	

* Extremes: 3 had 17 pregnancies each and 5 were nulliparæ.

TABLE K.—THE PARITY—(*continued*).

Division III:—

1 single ...	nullipara		
1 married ...	not stated		
11 married† ...	average pregnancies	... ...	7
	,, children	... ...	6·2
Total 13			

† Extremes: 1 had 13 pregnancies and 1 had 1 pregnancy.

TABLE L.—COMPLICATIONS.

Divisions I and II:—

Total, 91 cases:—
59 uncomplicated
32 complicated: a few patients had more than one of the following total, 39, complications found
  16 small fibroids, size 1½ in., 1¼ in. (both subserous cervical) and less, down to seedlings; (six interstitial in the outer half of the uterine wall and ten subserous) to be disregarded as active complications in the bleeding uterus; average age of patients, 45·2
  3 hydrosalpinges removed at the time of the hysterectomy; one unilateral at 46, two bilateral at 42 and 36
  2 the left appendage had been removed (1) six months ago at age 30; (2) twelve months ago at age 37
  1 both appendages had been removed seven years previously at age 39
  6 a few perimetric adhesions
  10 thickened capsules of both ovaries without cystic or apoplectic disease
  1 chorionic polyp, ½ in. by ½ in. by ½ in.

Division III:—

Total, 13 cases:—
12 uncomplicated
1 complicated; several small fibroids, size under ½ in., in the outer half of the uterine wall

THE PATHOLOGICAL REPORT.

The 104 uteri: Three were sacrificed to mincing in unsuccessful searches for hæmolytic lipoids; 101 were submitted to a *Histological Inquiry* in reference to (*a*) the musculature, (*b*) the fibrous tissue, (*c*) the elastic tissue, (*d*) the blood-vessels, (*e*) the evidences of infection.

(*a*) *The Musculature.*

Here the uncertainty of ensuring uniformity of preparation and observation of microscopic sections precludes positive statement; were it not so, this report would most probably go so far as to assert that the bundles of muscular fibres are more sparsely nucleated than those of post-mortem uteri of corresponding age.

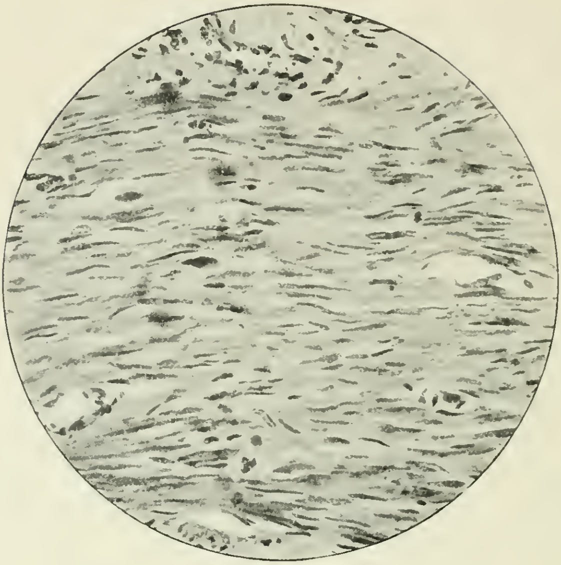


FIG. 1.

Muscle bundle. (× 400.) Control uterus, age 39.

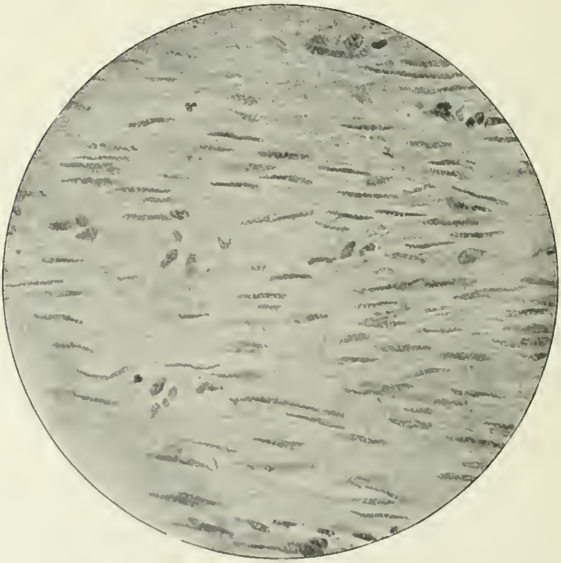


FIG. 2.

Muscle bundle. (× 400.) Bleeding uterus, age 42.

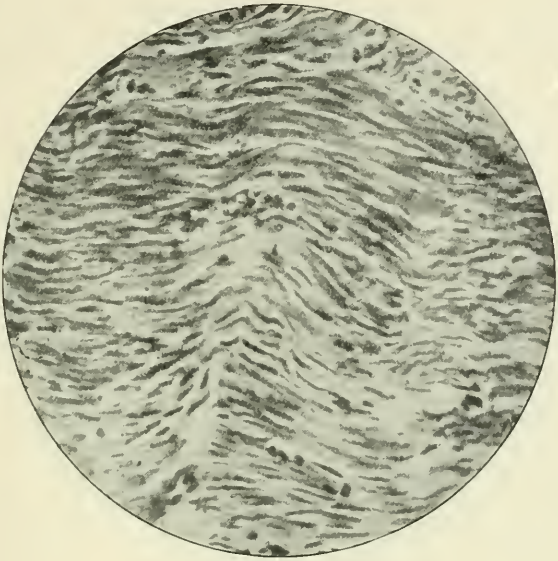


FIG. 3.

Muscle bundle. (× 400.) Control uterus, age 32.

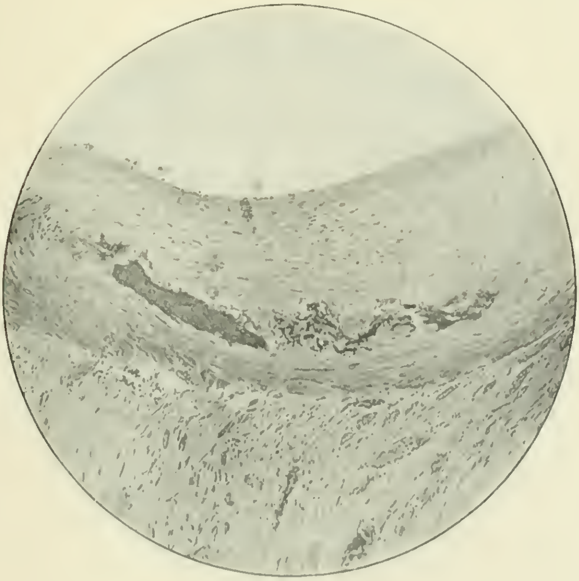


FIG. 4.

Calcification of media. (× 80.) Bleeding uterus.

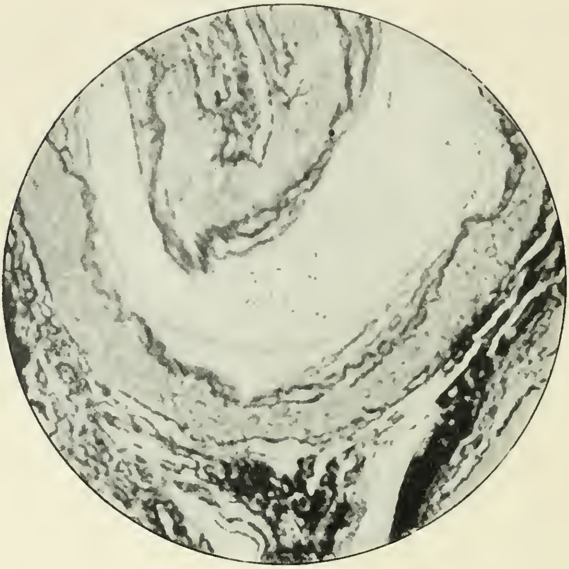


Fig. 5.

Localized thickening of the intima. (× 100.) Bleeding uterus.

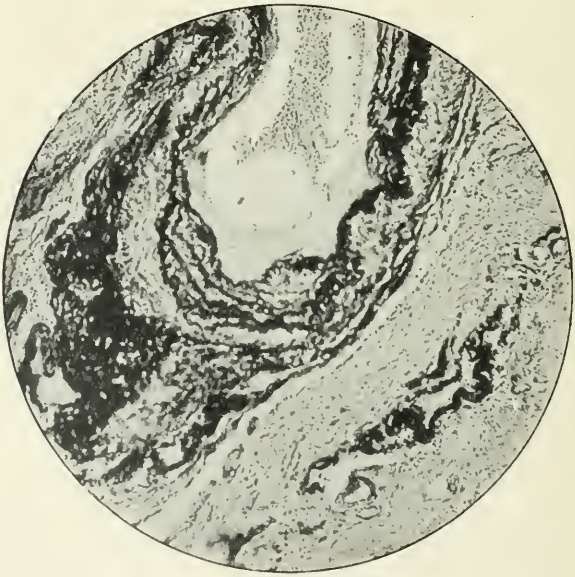


Fig. 6.

Localized thickening of the intima. (× 100.) Control uterus.

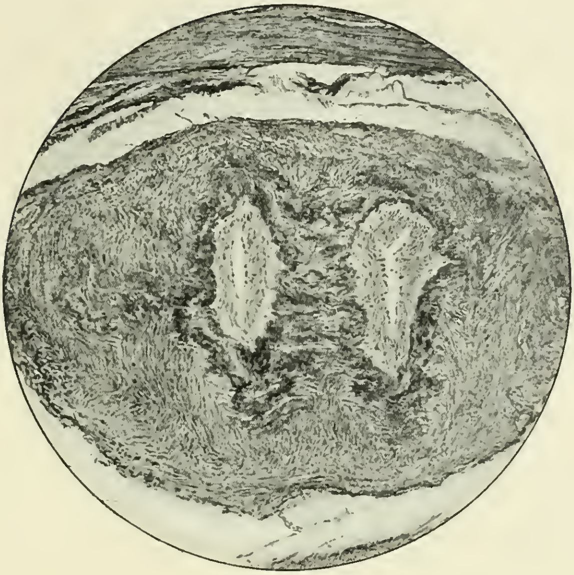


Fig. 7.

Thickening of intima. (× 100.) Bleeding uterus, age 30.

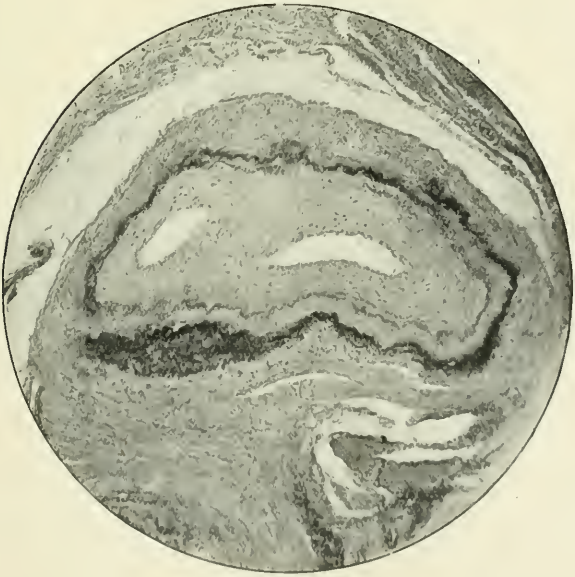


Fig. 8.

Thickening of intima. (× 100.) Control uterus, age 32.

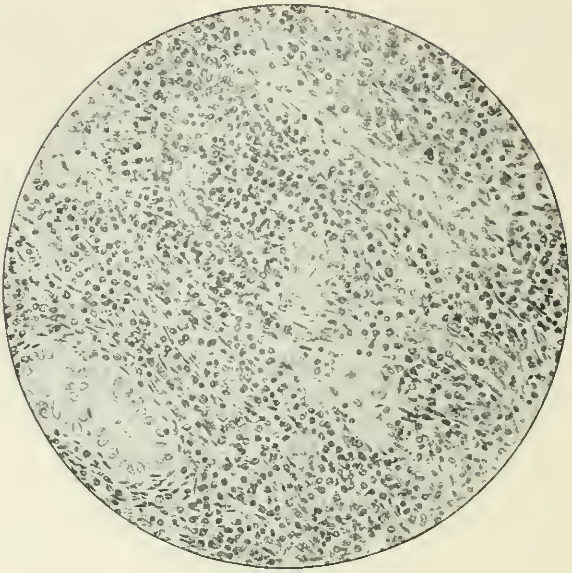


Fig. 9.

Many small round cells, with some polymorphonuclear leucocytes in the endometrium. (× 200.)

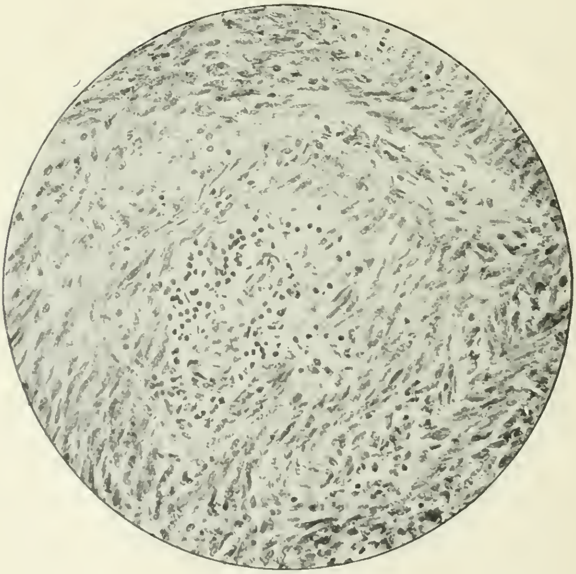


Fig. 10.

Perivascular focus of small round cells, with a few polymorphonuclear leucocytes in wall. (× 200.)

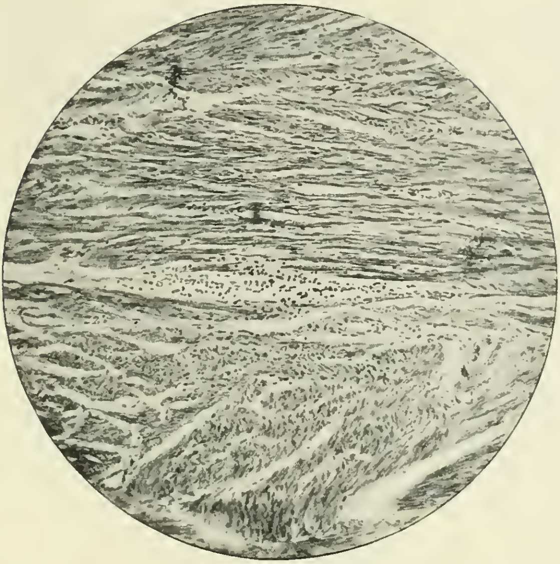


FIG. 11.

Many small round cells near a small blood-vessel in the musculature. (× 100.)

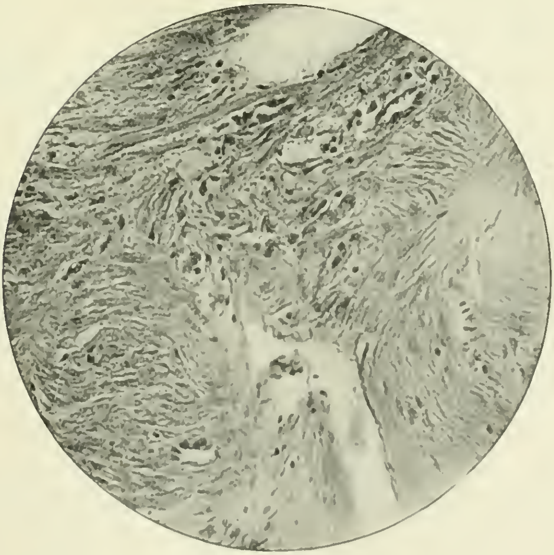


FIG. 12.

Scanty small round cells near a group of small blood-vessels in the musculature (from uterus in fig. 13). (× 200.)

For this observation exceedingly thin sections and an oil-immersion lens are essential; if both are available and the apparently more sparse nucleation is accepted as an accurate statement, the enlargement of the muscular fibre, equally consistent with either subinvolution or hypertrophy, becomes fallible evidence of muscular inadequacy. Œdema of the muscular wall was disproved by drying 10 grm., and finding a difference of only 1 per cent between fourteen bleeding and six post-mortem uteri. Fatty degeneration was sought for but not proved.

(*b*) *The Fibrous Tissue.*

An estimate, failing precise standards or tests :—

Divisions I and II :—	Control—post-mortem—uteri at corresponding ages
16 decided increase	2 decided increase
32 probable ,,	4 probable ,,
40 normal	6 normal
Total 88	Total 12
Summary.—In only one was the increase of fibrous tissue adequate for the total slight increase in size.	
Division III (ages 50 to 70) :—	
The 5 larger uteri, 3 oz. to 8 oz., proportionately more muscular tissue, resembled the uteri of Division II	
The 8 smaller uteri, 1 oz. to 2¼ oz., resembled the 6 control uteri	All showed a proportionate increase of fibrous tissue and decrease of muscle
Total 13	Total 6

(*c*) *The Elastic Tissue.*

An estimate :—

Divisions I and II :—	Control uteri
5 marked increase	1 marked increase
11 ,, decrease	2 ,, decrease
72 normal	9 normal
Total 88	Total 12

(*d*) *The Blood-vessels.*

The arteries: Variations in their number, size, and distribution were extreme.

Structural changes : (*a*) calcification of the media in one artery of the uterus of a 17-para, aged 50, of Division II ; the intima was thickened and brought this under (*b*) below.

(*b*) Thickening of the intima :—

In a few large vessels (Division I)	in	1	out of	9
,, ,, (Division II)	,,	15	,,	79
In more vessels (Division III)	,,	9	,,	13
		25	,,	101
The intima was normal	,,	76	,,	101

The thickening of the intima in the above twenty-five, the youngest aged 30, the oldest aged 72, was not always uniform around the lumen, and in one-half of the instances there was additional fine internal elastic lamina, the product of greater age. The thickening of the intima was found in four control uteri out of twelve. Thickening, with or without splitting, of the internal elastic lamina, of the media and of the adventitia, were equally common in parous bleeding uteri and in parous control uteri.

The veins: No pathological changes.

(*e*) *The Evidence of Infection.*

Acute infection in four cases was founded on polymorphonuclear leucocytes with many small round cells in both the uterine wall and the endometrium. The four cases included three in Division II—in one a thickened endometrium, in two a sessile adenoma amidst thickened endometrium; one in Division III—a sessile adenoma amidst thickened endometrium.

Chronic infection in the muscular wall: Small round cells or mononuclear lymphocytes were found in fifty-nine. Forty-two in Divisions I and II—two or three lymphocytes around an odd minute vessel, pathologically insignificant. Ten—lymphocytes more abundant and widely spread; in three of the ten an additional solitary focus of small round cells without polymorphonuclear or plasma cells; in two of the three in the outer half; in one of the three at the junction of the inner and middle thirds of the muscular wall. The solitary focus resembled the foci familiar in chronic interstitial nephritis. In the whole of the ten, a chronic toxic irritation, rather than a chronic bacterial infection, is suggested. Five in Division III: two or three lymphocytes around an odd minute vessel, pathologically insignificant. Two—lymphocytes more abundant and more widely spread, probably, as stated above, due to toxic irritation.

Chronic infection in the endometrium: The normal presence of small round cells introduces confusion; an excess of small round cells or mononuclear lymphocytes is reported in sixteen.

Divisions I and II:—

13 { 3 acute infection—additional polymorphonuclear leucocytes.
{ 10 chronic infection—
 3 of the 10—additional foci of small round cells.
 4 of the 10—plasma cells; in 1 of the 4 five giant cells.
 9 of the 10—fibrous tissue excess.

Division III:—

3 { 1 acute infection.
{ 2 chronic infection.

REMARKS ON CHRONIC INFECTION.

Long-standing chronic infection in any organ is established by histological evidence of extensive round-celled infiltration, extensive fibrosis and ultimate diminution of total bulk. In the 101 uteri, an active chronic infection is inconsistent with the scanty histological evidence. An existing chronic infection is not necessarily primary; it may be consecutive or secondary.

REMARKS ON THE ENDOMETRIUM.

In the 88 uteri of Divisions I and II a relation was not observable between the varieties of the endometrium and the severity of the hæmorrhage: the histological changes were not inconsistent with Hitschmann and Adler's view that glandular and stromal hyperplasia belong to the normal menstrual cycle and not to either glandular or interstitial endometritis.

CONCLUSIONS.

From the pathological evidence embodied in this report, and from the physiological observations of Hitschmann and Adler, the thesis is deducible that uncontrollable uterine hæmorrhage is a functional disturbance. The disturbers, local and general, are numerous and varied. Amongst them, arterio-sclerosis, fibrosis uteri, chronic metritis, and chronic infective endometritis have been appraised, too highly and too widely, within the fields of gynæcological pathology and treatment.

A SHORT REVIEW OF THE CLINICAL EVIDENCE.

Curettage, at its best as a curative agency in the removal of the friable relics of conception two or three weeks and onwards after an early abortion, accumulates its failures elsewhere, and many are referable to the diagnosis of endometritis.

The exalted influence attached to primary disease of the endometrium has been shaken from many directions: notably and within the scope of this review from cases of excessive uterine hæmorrhage, the curettings have too often revealed to the microscopist the cyclical tissue changes in an exaggerated, in an average, or in an attenuated degree.

Curettage succeeds and fails in both treatment and exploration, contrary to expectations.

Within a series of cases of uncontrollable uterine hæmorrhage, the uterus may be more or less under the influence of collateral local disease from the same or a dissimilar cause, such as appendage disease, uterine new growths, and retained products of conception.

Table L (p. 199) gives the character of the forty total complications distributed amongst thirty-three cases, which leave seventy-one uncomplicated cases.

The inclusion of complications is inevitable on the recognition of the paramount condition.

An increasingly "menorrhagic" uterus after a brief period of amenorrhœa becomes by the incompletion of an early abortion a "metrorrhagic" uterus.

The gynæcologist who has previously recognized the bleeding uterus finds it complicated by a small placental polyp.

The obstetrician, if the abortion has been in evidence, makes the reverse entry of an abortion, complicated by a bleeding uterus.

Opportune additions at this point are (1) that the average abortion-rate of 15 to 17 per cent. had not been exceeded, and (2) that sterility, in only five of ninety-five married women, was below the average.

For easy reference the more important clinical facts have been arranged in Tables A to L (pp. 195 to 199).

The following detailed reports of eight cases (pp. 209 to 214) display the variable physical conditions amidst which the uterus bleeds:—

Complicated	(1) Enlarged bleeding uterus with bilateral hydrosalpinx (2) Enlarged bleeding uterus, after bilateral appendage removal seven years previously (3) Fibroid, fibrosis uteri and diffuse adenoma (4) Large uterus and tiny inaccessible fundal polyp (5) Large benign polyp of many years' standing at the age of 72; three months' uterine hæmorrhage (6) Bleeding uterus with incomplete early abortion
Uncomplicated	(7) A typical bleeding uterus; eight curettages in eleven years (8) A small bleeding uterus after several curettages in three years

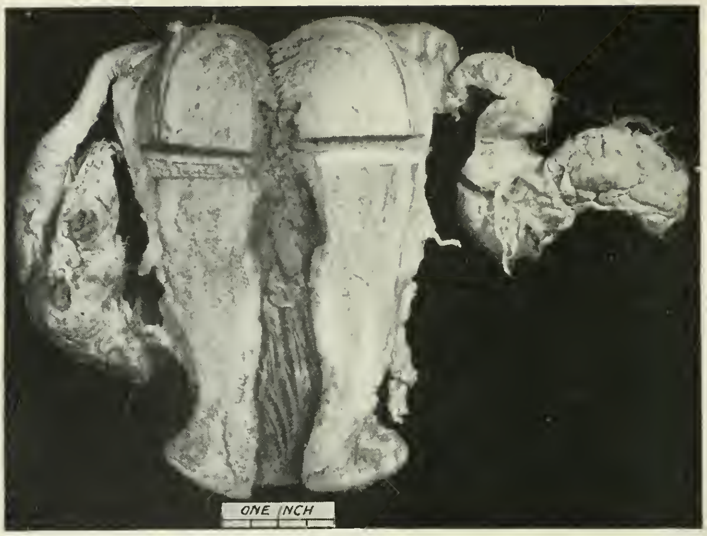


Fig. 13 (Division II).

Enlarged uterus. Weight, 5¼ oz.; external measurements, 4¼ in. by 2¼ in. by 1¾ in.; the wall, ¾ to 1 in. thick; the vessels not prominent; the endometrium, ⅛ to ¼ in., rough and nodular; excess of small round cells and plasma cells; in the muscular wall an occasional perivascular round-celled infiltration; bilateral hydrosalpinx and oöphoritis.

H. G., aged 36, ten years married. Sterile. Menses, 4/28 days, painful, increasingly excessive; became 4/14 days for the past nine months. Vaginal radical operation, August 9, 1912.
Note.—The object-lessons are the slight histological evidence of chronic metritis and the unusual predominance of uterine enlargement and hæmorrhage in the course of a pelvic infection of ten years' standing.

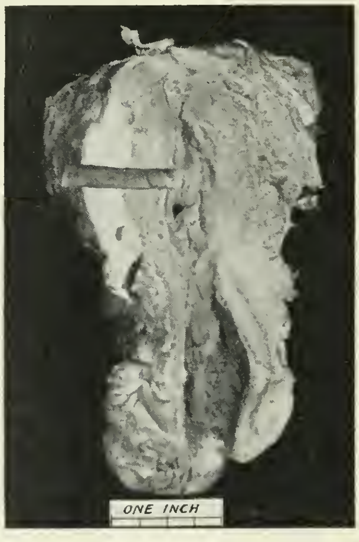


Fig. 14.

Enlarged uterus. Weight, 3¾ oz.; external measurements, 4 in. by 2 in. by 1¾ in.; the wall, ⅞ to 1 in. thick; the vessels not prominent; the endometrium thickened and nodular.

J. J., aged 46, ten years married. Two abortions. Menses, 5-7/28 days, excessive. Seven years ago both appendages were said to have been removed for "tumours." On September 20, 1911, during the vaginal hysterectomy for a twelve months' intermittent uterine hæmorrhage, relics of the tubes or ovaries were not traced.
Note.—The absence of evidence of infection in the uterus surrounded during life by dense adhesions.

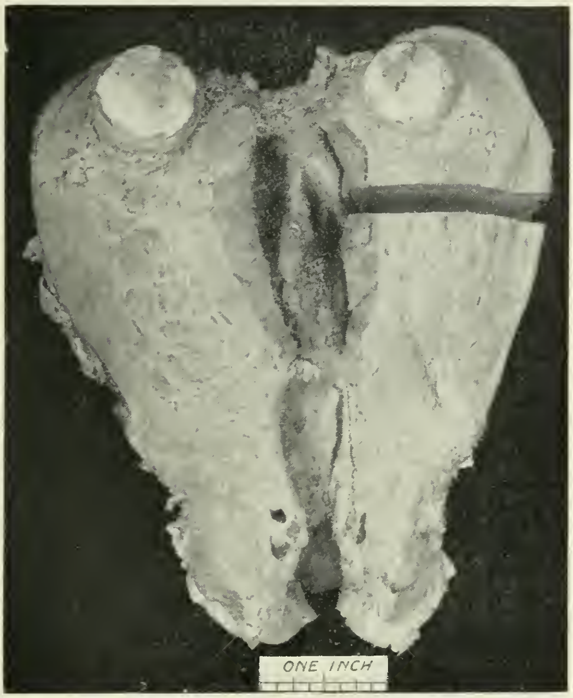


Fig. 15.

Enlarged uterus. Weight, 10 oz.; external measurements, 5 in. by $3\frac{1}{2}$ in. by 3 in.; thickness of wall, $1\frac{1}{2}$ in.; endometrium, $\frac{7}{16}$ in.; a solitary small interstitial fibroid, $\frac{5}{8}$ in.

A. P., aged 47, twenty-six years married. Seven pregnancies; five healthy children, the youngest aged 14; one stillbirth at the full term between the third and fourth children; one abortion at the third month between the fourth and fifth children. Menses, 5-7/28 days, regular, copious, no pain, no clots; leucorrhœa. In September, 1911, one week after the last regular period and one hour after a fall downstairs, uterine hæmorrhage commenced and continued for two weeks; the bleeding recurred, the longest interval thirteen days, the shortest three days. She was in bed nearly the whole five months until the hysterectomy on January 31, 1912. After-history: She is in perfect health; she has lost her anæmia and is now florid (January 19, 1914). Pathological report: The uterine wall—a large amount of fibrous tissue, also a small number of round cells around a very few small vessels; the evidence is too meagre to establish any infection.

As (1) fibroid, (2) fibrosis uteri, and (3) diffuse adenoma, the preceding case can be classified.

Note.—Uterine fibroids, subserous and deeply interstitial as common growths, frequently incidental in other affections of the uterus, have been classed as extraneous complications in 17 of the 101 bleeding uteri.

The presence of an adenoma in the next two uteri is noteworthy.

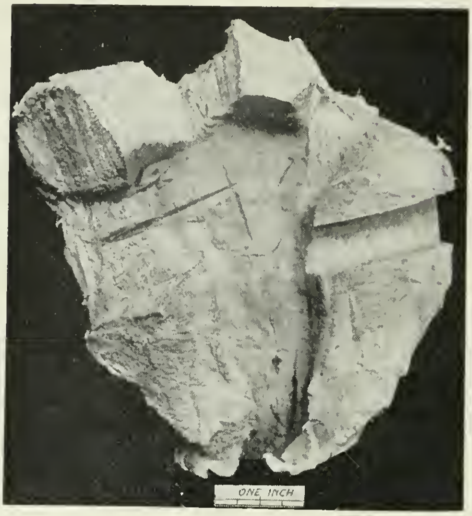


Fig. 16.

Enlarged uterus. Weight, 9½ oz.; external measurement, 4½ in. long; thick walls; sessile adenoma, ⅜ in. in diameter at the right fundal angle; endometrium not thickened.

Mrs. B., aged 53. Seven children, the youngest aged 21. Almost continuous hæmorrhage for four years; profound anæmia resembling pernicious anæmia, necessitating four months' total rest in bed. Curettage in April, 1901, without improvement. Vaginal hysterectomy, July 25, 1901. After-history: In good health January, 1914. Pathological report: Endometrium normal; musculature—no excess of fibrous tissue; diminution of elastic tissue; muscular hypertrophy; very slight perivascular round-celled infiltration.

Note.—The tiny polyp, inaccessible to either curette or finger, in a four years' hæmorrhage from a uterus weighing 9½ oz., is an insignificant pathological feature.

The converse of the preceding tiny polyp is seen in the photograph of the uterus, 5 oz. in weight, laid open, after hysterectomy, to expose its contents—a large benign stalked adenoma.

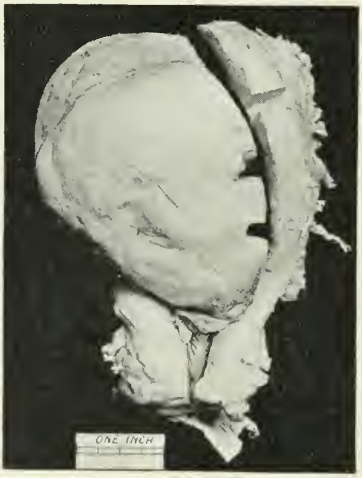


Fig. 17.

S. H., forty-eight years married. Eight children, the youngest aged 34. The menopause at age of 42, after a normal menstrual life. Three months' constantly increasing continuous hæmorrhage at the age of 72 suggested the possibility of fibroid and an early cancer.

Note.—The protracted bloodless course of a large benign adenoma with a small proportion of fibrous tissue; the hypertrophy of the wall of the uterus at the age of 72 confirms the chronic course.

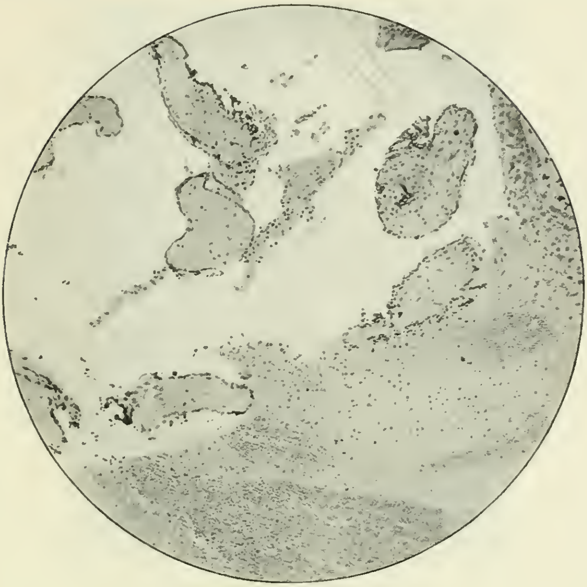


FIG. 18.

Chorionic villi in $\frac{1}{2}$-in. by $\frac{1}{2}$-in. by $\frac{1}{8}$-in. polyp. (× 80.)

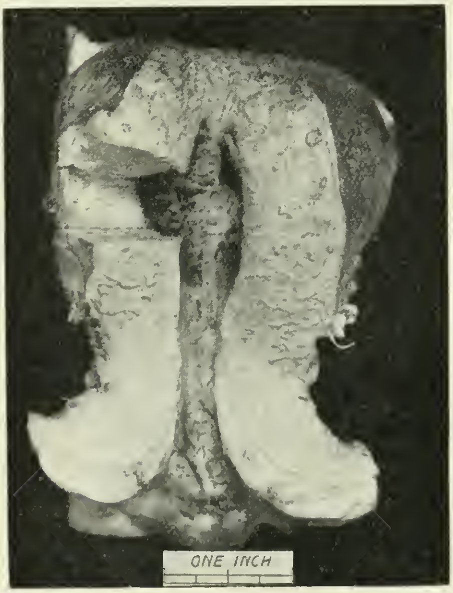


FIG. 19.

Enlarged uterus. Weight, $4\frac{1}{2}$ oz.; external measurements, 4 in. by $2\frac{1}{4}$ in. by $1\frac{5}{8}$ in.; the wall, $\frac{3}{4}$ to $\frac{7}{8}$ in. thick, with prominent vessels; the endometrium not thickened; a small polyp, $\frac{1}{2}$ in. in diameter, in the left fundal angle consisted of blood clot; a little decidua and chorionic villi.

C. B., aged 42, twenty-two years married. Eight pregnancies; seven children, the youngest aged 7; one abortion sixteen years ago. Menses, four years' increasing menorrhagia, now 8-9/21 days, the last period, two weeks late, continued, with two intermissions of two and ten days, for six weeks. Vaginal hysterectomy, January 24, 1913.

Note.—An incomplete abortion in an otherwise typical bleeding uterus.

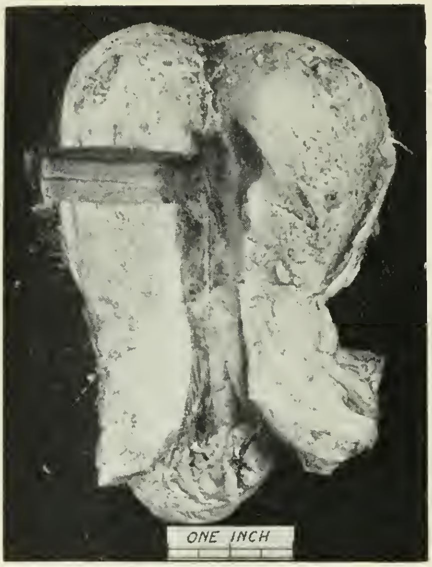


Fig. 20.

Enlarged uterus. Weight, 5 oz.; external measurements, 3½ in. by 2½ in. by 2 in.; the wall 1⅛ in. thick, soft, with prominent vessels; the endometrium not thickened.

M. B., aged 46, twenty-two years married. Eight children, the youngest aged 8; all forceps deliveries. Menses, 3-4/28 days, regular; leucorrhœa, menorrhagia for many years. First curetted on January 8, 1900; again in 1903, and six times during the next four years. The menorrhagia continued unabated. At Christmas, 1910, she was bleeding 7-10 days every two or three weeks; since then rarely free from blood-loss for more than seven days. Losing weight for five months. Vaginal hysterectomy, September 1, 1911. Pathological report: Only an occasional lymphocyte and a doubtful increase of fibrous tissue in the muscular wall.

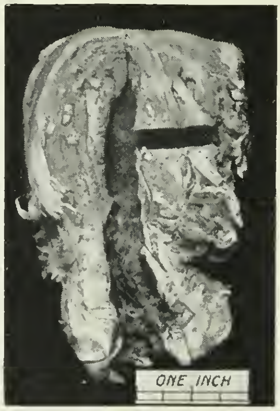


Fig. 21.

Uterus faintly enlarged. Weight, 2½ oz.; external measurements, 3 in. by 1⅝ in. by 1⅜ in.; wall, ¾ in., slightly soft; vessels very prominent; endometrium congested, not thickened.

A. S., aged 51, twenty-six years married. Ten pregnancies; three children, the youngest aged 17 years; seven abortions, the last fourteen years ago. Menses, originally regular, 7/28 days. In 1899 the uterus was curetted for post-abortum hæmorrhage; in 1909 one month's bleeding ceased spontaneously. In 1912 her doctor sent her to hospital with the statement that curettage had been repeated several times and failed. Vaginal hysterectomy, May 3, 1912. After-history: January, 1914, in good health. Pathological report: Endometrium contains a large amount of blood; it resembles the senile type; fibrous tissue in the muscular wall not excessive; thickening of the intima of some of the large arteries; no excess of round cells in either endometrium or muscular wall.

A SUMMARY OF THE VARIOUS VIEWS OF UNCONTROLLABLE UTERINE HÆMORRHAGE.

[1] In 1897, Reinicke, in four cases, found arterio-sclerosis and fibrosis; neither, in his opinion, sufficient to cause the menorrhagia; a second essential being an increased pelvic congestion, probably initiated by the ovary.

[2] In 1899, Pozzi reported, in two uteri from patients aged 30 and 34, an increase of elastic tissue.

[3] In 1899, Sir John Bland-Sutton, under the title "Fibrosis Uteri," called attention, in mothers aged from 35 to 45, to three cases of menorrhagia uncontrolled by drugs, rest, or curettage. He described the enlarged uterus, with thick, tough walls and prominent vessels, due to an abnormally excessive fibrous tissue formation replacing some of the muscular tissue as a remote result of septic endometritis.

[4] In 1905, Freeland Barbour reported a case as climacteric hæmorrhage, due to sclerosis of uterine vessels.

[5] In 1906, Gardner and Goodall, from nine cases of "Chronic Metritis and Arterio-sclerotic Uteri," separated the simple and the complicated chronic metritis, by the absence or the presence of appendage disease; the simple metritis in two groups—(*a*) those arising from subinvolution, infection, or one of many other causes, and showing a deposit probably of elastic tissue, and (*b*) those having a true arterio-sclerotic origin, characterized by a true fibrosis of the uterine wall. A muscular and fibrous tissue increase; the hæmorrhage, accentuated by, but not due to, changes in the endometrium, was attributed to a combination of vascular changes, fibrosis, and relative muscular insufficiency.

[6] In 1906, Addinsell reported as chronic infective metritis four cases in younger women, aged 29 to 34.

[7] In 1907, Shaw, as chronic metritis in thirty-eight patients of average age 38, described simple hypertrophy, never primary, usually secondary to chronic endometritis, and with no evidence of active inflammation.

[8] In 1908, Ehrenfest suggested that the hæmorrhage might be brought about by increased muscular tone—a form of spasm found in some neuroses.

[9] In 1909, Mrs. Willey considered that cases of menorrhagia, not due to uterine new growths or tubal disease, were associated with either (*a*) congestion of the uterus arising from local or general causes, or (*b*) inefficient muscular action, either a local degeneration or part of a general atony.

[10] In 1909, Anspach, as "Myopathic Uterine Hæmorrhage," described two varieties of chronic metritis: (1) actual fibrosis after acute metritis, associated with adnexal disease; (2) chronic from the onset of subacute infective metritis, subinvolution, and pelvic congestion. The hæmorrhage, purely the result of myopathic disease, may be due to absence of the normal increase of connective and elastic tissues, with resulting engorgement and congestion. In many cases the symptoms are not dependent on histological changes in the muscular wall, but arise from fungous endometritis, hypertrophic or cystic cervix, displacements, inflammation of the adnexa or pelvic cellular tissue, or congestion of the pelvic blood-vessels from cardiac or renal disease or general weakness.

[11] In 1910, Goodall described an increase in elastic tissue.

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[8] Ehrenfest. *Amer. Journ. Obstet.*, New York, 1908, lvii, p. 261.
[9] Willey. *Journ. Obstet. and Gyn. Brit. Emp.*, 1909, xvi, p. 236.
[10] Anspach. *Surg., Gyn., and Obstet.*, Chicago, 1909, ix, p. 315.
[11] Goodall. *Amer. Journ. Obstet.*, 1910, lxi, p. 32.
[12] Hitschmann and Adler. *Münch. med. Wochenschr.*, 1909, lvi, p. 2130.

Hysterectomy.—A defence of the operation is not within the scope of this report.

Mortality.—There were two deaths in the 104 cases. In the Appendices A and B are the clinical records of the two cases.

Acknowledgments.—In the Gynæcological Laboratory of the University of Liverpool, as Ethel Boyce Fellow in Gynæcological Pathology, Dr. Hendry has, during the past three years, assiduously conducted the research on which the report is based. The Laboratory assistants, Messrs. Macdonald, Norman and Robinson, have prepared the sections and taken the photographs. The whole of the uteri were from the hospital and private practice of Professor Briggs, with the exception of one kindly presented by Dr. Sumner, of Waterloo. Professor Beattie and Professor Ernest Glynn have very generously advised or approved at critical points in the work. Grateful thanks are given to them, also to Professor Benjamin Moore and Professor Lorrain Smith, for guidance on the important question of fatty changes in the uterine wall.

APPENDIX A.

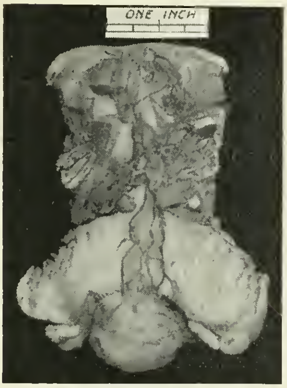

FIG. 22.

Small uterus. Weight $1\frac{3}{4}$ oz.; external measurements, 3 in. by $1\frac{1}{2}$ in. by $\frac{3}{4}$ in.; the vessels prominent; the endometrium not thickened; the cervix large.

C. J., aged 69, thirty years married. Three pregnancies; two children, the youngest aged 26; one abortion. The menopause at the age of 50 after a normal menstrual life; prolapsus during twenty-eight years after a difficult first confinement. For two months two or three days' hæmorrhage, with intervals of two or three days. Diagnosis; Cancer of the cervix. Vaginal hysterectomy and perineorrhaphy, January 13, 1911. She died on February 16, 1911, from hypostatic pneumonia.

APPENDIX B.

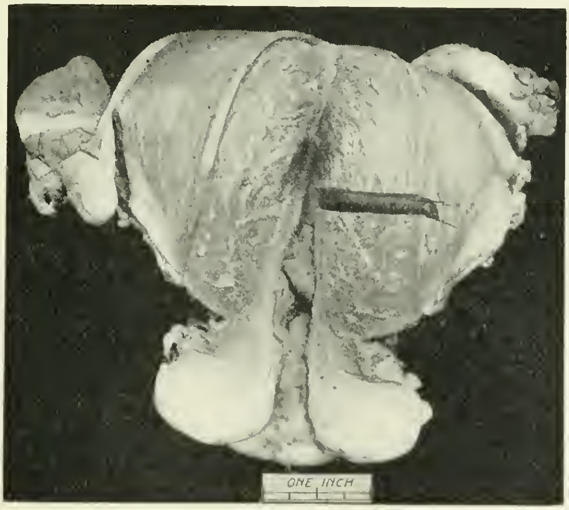

FIG. 23.

Enlarged uterus. Weight, 7 oz.; external measurements, $3\frac{3}{4}$ in. by $2\frac{3}{4}$ in. by 2 in.; thickness of wall, 1 in.; endometrium not thickened; small clot in lower half of body; cervix eroded; normal appendages also removed.

A. C., aged 48, twenty-two years married. Four children, the youngest aged 13; two abortions. Menses normal until November, 1912. Two months' profuse hæmorrhage, which continued in lessened amount until the abdominal hysterectomy, April 25, 1913. A double femoral hernia also radically cured at the same time. She died on April 30, 1913, from pulmonary embolism.

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DISCUSSION.

The **President** offered the thanks of the Section to Dr. Briggs and Dr. Hendry for their valuable contribution to our knowledge of a very difficult problem. The authors must have felt some disappointment at the outcome of such a laborious piece of work, which yielded little positive results; indeed, the great value of their investigations lay in the evidence which they adduced and which appears conclusive that structural changes in the uterus in these cases are rare, and certainly are not necessary causes of the hæmorrhage—a conclusion with which Dr. Griffith, from his own observations, fully agreed. The authors attribute the persistent hæmorrhage to "functional" causes, a vague and unsatisfactory statement, but one which indicates that future investigation must proceed on different lines—the minute examination of the blood and its circulation, and the possible influence of syphilitic or other toxic conditions.

Dr. **Williamson** congratulated the authors of the paper upon a piece of work which was likely to prove of lasting value. A series of investigations of this kind was needed at the present time. Many writers had described changes in the uterine muscle, in the blood-vessels and in the endometrium, which they regarded as pathological and as the causes of excessive bleeding, but there could be little doubt that many of the changes so described were physiological rather than pathological. So far as he was aware, up to the present time the histological condition of the uteri removed for bleeding had never been compared with a series of uteri from women of similar age in whom there had not been excessive bleeding. The authors had done this with great care and with much patient labour. It did not detract in the least from the value of the paper that their conclusions were negative rather that positive, for by this research they had cleared the ground of much misconception, and the paths along which future investigations should be conducted had become more clearly defined. He did not regard the paper as quite so satisfactory and convincing from the clinical as from the pathological point of view. The authors had not defined what they meant by intractable hæmorrhage. No hint was given, at any rate in the portions of the paper read, as to what methods of treatment had been tried or what minor surgical procedures had been adopted before resorting to hysterectomy. In the use of radium we had a method of treatment still upon its trial. Dr. Williamson had used it in several cases of prolonged hæmorrhage about the time of the menopause. His method of treatment was to dilate the cervix uteri under an anæsthetic, to remove with the curette a small portion of the mucosa for microscopical examination, in order to exclude the possibility of malignant disease, and then to insert 130 mg. of radium into the uterine cavity, leaving it there for from twenty-four to thirty hours. In some cases bleeding had ceased from the time of application and had never recurred. He was by no means prepared to say that the use of radium, at the present time, should replace the operation of hysterectomy in all cases of the class described by the authors, but he intended himself to give the treatment a prolonged trial.

Dr. R. A. Hendry stated that the alterations in the blood had not been included within the scope of his inquiry and report. Under excessive uterine hæmorrhage he had limited his investigation to the local conditions commonly known as fibrosis uteri, chronic metritis and arterio-sclerosis, where other local disease—fibroids, appendage inflammation, retained conception products—was not present, or if present not paramount. He pointed out the gradually increasing hæmorrhage throughout the long history, an average of four years, and the failure of both general medical treatment and minor surgical treatment. He justified the inclusion of twenty stalked or sessile adenomata within the series by the inconsistency of including uteri with a smooth endometrium half an inch thick and excluding others in which a smaller total bulk of endometrium existed as stalked or sessile adenomata, by the impossibility of placing a limit to the size of an acceptable localized adenoma, and by the prolonged bloodless course of some adenomata.

Dr. Briggs, in reply, remarked on the advantages of the report. The after-histories of cases of polyp removals, or the results of the administration of calcium salts, were ample illustrations of the interminable character of the inquiry.

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Obstetrical and Gynæcological Section.

March 5, 1914.

Dr. W. S. A. Griffith, President of the Section, in the Chair.

Decidual Cast from the Unimpregnated Horn of a Didelphic Uterus.

Shown by J. Braxton Hicks, M.D.

(For T. G. Stevens, M.D.)

The clinical notes of this case were read at the meeting held on February 5.[1] The specimen shown is one of the decidual cast passed by the patient during the puerperium, and undoubtedly comes from the unimpregnated horn of the didelphic uterus. The cast measures 8 cm. by 6·5 cm. and is 1·5 cm. thick in parts. It has the ordinary appearances of a cast such as might be met with in a case of ectopic gestation, save that it is larger and bulkier.

Microscopically it consists of a fine connective tissue basis in which are decidual cells, interglandular cells, and the remains of uterine glands. These latter for the most part appear as spaces containing blood, in which the lining cells where present may be seen to be the familiar uterine gland cell. Practically all the cells present show a greater or less amount of degeneration.

Multiple Myomectomy in the Sixth Month of Pregnancy; Labour at Term.

By Cuthbert Lockyer, F.R.C.S.

The patient was a primigravida, aged 41. She had been married seven and a half years. The last menstrual period was in May, 1913. The periods began at the age of 15½, were quite regular, and the loss was scanty. There was occasional premenstrual pain.

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[1] *See* p. 186.

Since May, 1913, the patient had complained of pain in the lower abdomen, which had gradually increased in severity. Relief was only obtained by lying down. There was increased frequency of micturition; the desire to void urine was constant. Constipation was also troublesome. Before admission into the Charing Cross Hospital there had been a continuous brown vaginal discharge for three months. For the above symptoms I treated the patient in the out-department up to the end of August; at which date I was uncertain whether she was pregnant or not. There was a rounded hard mass filling up the posterior half of the pelvis and rising up into the abdomen. The cervix was elevated, and the external os lay behind the symphysis. In the abdomen there was a mass reaching half-way to the umbilicus, more or less spherical in outline, but rendered irregular by a nodule on the left side. The pelvic portion of the mass was quite fixed.

I next saw the patient in the Golding Ward, two months later (October, 1913, on my return from my holiday). She had then been examined by my senior colleague, Dr. Eden, whose note reads as follows: "Breasts firm and large, a little serum present. Lower abdomen prominent, presenting an elastic mass extending three fingers' breadth above the umbilicus, nodular in outline, variable in consistence, tender on the left side. *Per vaginam:* Cervix much displaced upwards and forwards, external os level with the middle of the pubes. Large tumour of dense consistence filling the pouch of Douglas." After a consultation with Dr. Eden it was decided to open the abdomen. This I did with Dr. Banister acting as my assistant.

On October 24, 1913, a median incision was made from the umbilicus to the pubes. The uterus was eventrated and a fibroid the size of a fœtal head was removed from the lower uterine segment on the right side, and a second tumour the size of a small hen's egg was enucleated from the left posterior aspect of the uterus a little higher up. The mucous membrane of the cavity of the uterus was not seen, although the bed of the larger tumour was deep. Buried mattress sutures of catgut were used to close the wounds and the peritoneal coat layer was brought into apposition by Lembert sutures of fine silk.

There was slight post-anæsthetic vomiting, and a very slight, bright red vaginal discharge lasted for two days; for this a cotarnine salt was given. The abdominal stitches were removed on the eighth day. The convalescence was uneventful.

Subsequent health was good and the patient was readmitted on February 18, at 6 a.m., when she stated that there had been pains at wide intervals for the previous six hours, and that two days previously there had been a "show."

The notes taken by Mr. Marshall, the Resident Obstetric Officer, are as follows :—

Examination on admission showed a keloidal scar. The fœtus was in the left occipito-anterior position; the fœtal heart sounds were easily heard. The cervix was patulous, admitting the index-finger, but the internal os was still distinct. The rectum was loaded. Not much change was observed until 9 p.m. on the same day—in fact, until that time the patient was quite comfortable; strong and frequent pains then set in fairly suddenly, coming every ten to fifteen minutes and lasting twenty to thirty seconds. The cervix was fully dilated by 11.30 p.m. The membranes ruptured at 12.15. The head was at the perineum for twenty minutes, and then a healthy female child, weighing 5 lb. 12 oz., was born. The placenta followed in twenty minutes. There was but little bleeding. The uterus contracted very satisfactorily, but 1 c.c. B.W. ernutin was administered. There was a small perineal tear, little more than 1 in. in length. The patient had a comfortable night. February 19: The uterus was just below the umbilicus, contractions were readily induced. The loss was quite slight. The pulse was steady with slightly elevated temperature. The next day (February 20) the child obtained some milk from the breasts, and afterwards the supply was plentiful. Subsequently the uterus involuted at the normal rate. The lochia was slight in amount, and quickly brown. There was no morbidity. The perineum healed *per primam.* March 5: Mother and child quite well, abdominal wound sound.

The tumours as seen in the mounted specimen shown herewith present the red degeneration so common to fibroids during pregnancy. This necrobiotic change has commenced in the centre of each growth and is spreading to the periphery, but it is by no means universal. The sections were taken from the periphery before hardening and showed normal fibromyomatous tissue, with but little hyaline change, this being accounted for by the growths being interstitial and not subperitoneal. The knowledge that red degeneration is found in the majority of fibroids complicating pregnancy is to my mind no justification for the removal of these growths during gestation; the indications for myomectomy on the gravid womb must be few, and this operation has been performed possibly more often than in the opinion of the Fellows of this Section it would be deemed wise or justifiable. But cases *do* occur from time to time in which, after careful thought, this treatment would seem to be the best, and I am venturing to claim that the case here detailed is one of them. The alternative of course was to let the pregnancy go to term and perform Cæsarean section and myomectomy. The plea in favour of this alternative would be the risk of abortion resulting from the myomectomy; but Doran, Thring, Russell, Andrews, Swayne, and many other operators have shown that the pregnant uterus *will* tolerate myomectomy; and in this case we had to decide whether the extreme discomfort as regards micturition and bowel symptoms should be allowed to go on for another four and a half months, or not. Another point was the fact that there was a brown discharge continuing for twelve to thirteen weeks before admission; would the irritation produced by the tumours lead to the onset of premature labour? If so, the passages were blocked, and the child would die of prematurity, even if Cæsarean section be performed.

I have seen many fibroids ascend in the later months of pregnancy, but the larger of the two I removed in this case was too far down in the lower segment to render this possible; it was impacted in the pelvis, pressing on the rectum, and displacing the cervix upwards and forwards; the sole choice was immediate myomectomy, or Cæsarean section followed by enucleation at full term, and the "symptom complex" decided my colleague and myself that the former was the better course to adopt in this particular case, and the ultimate issue seems to indicate that we were right.

DISCUSSION.

Dr. TATE entirely agreed with the method of treatment carried out by Dr. Lockyer—enucleation of fibroids impacted in the pelvis and causing severe symptoms was absolutely necessary in certain cases of pregnancy. During the last few years Dr. Tate had operated in two similar cases at the third and fifth months of pregnancy. In one case the symptoms caused by the fibroid started very acutely, and the tumour when removed showed marked necrobiotic change. He thought that the risk of miscarriage occurring after enucleation of fibroids was a very small one, if care was taken to carry out the manipulations as gently as possible.

Dr. ARTHUR GILES endorsed the view expressed by Dr. Tate that myomectomy during pregnancy entailed very little risk of interference with the pregnancy; he had operated in three such cases, and the patients had all gone to full time without showing any signs of disturbance. In all the cases the fibroid tumour removed showed that form of necrobiosis known as red degeneration, to which such tumours appear so prone when they are found in the pregnant uterus. The striking feature of such conditions was the pain from which patients suffered. In one of his cases there was a hard rounded tumour to be felt, and the onset of pain had been so acute and severe as to lead to a diagnosis of ovarian tumour with a twisted pedicle; he felt sure that Dr. Lockyer had adopted the right course in operating without waiting till the end of the pregnancy, as he thereby saved the patient much suffering, and avoided the possibility of serious trouble during labour.

Mrs. SCHARLIEB said that, bearing on the subject of *myomectomy during pregnancy*, there were two cases at the Royal Free Hospital:—

Case I.—Mrs. H. H., aged 37, was admitted to the Royal Free Hospital suffering from abdominal pain and vomiting. She was married on June 28, 1903, and menstruated on July 14. Pain and sickness began almost immediately, and in the middle of September she was evidently nearly three months pregnant. On examination a firm swelling was felt behind the uterus which appeared to be a fibroid, and a smaller, more movable mass could be felt farther to the right. The vomiting persisted, and the pain became worse. In October the movable mass towards the right had greatly enlarged. At the time of operation, October 27, the median tumour was seen to be reddish-brown, and the size of a large orange: the upper, more movable mass was a dermoid ovarian tumour with a long, slender, twisted pedicle. The fibroid was enucleated, and the uterine wall repaired. The ovarian tumour was removed in the usual manner. On examining the fibromyoma it was found to be in a state of red degeneration. The patient went to full term, and was delivered of a living child.

Case II.—Mrs. S. K., married three years, two children, three and a half months pregnant, came to hospital complaining of falling of the womb. The uterus was found to be retroverted and right lateroverted. A tumour the size of a large hen's egg was felt in Douglas's fossa. On opening the abdomen a subperitoneal fibroid was recognized. It took its origin from the posterior aspect of the right side of the uterus, and was connected with it by a base about the size of a florin; it was adherent to the bowel. The adhesions were separated, and the fibroid was removed. The wound in the uterus was closed by mattress sutures. On examining the fibroid it was found to be undergoing necrobiotic change, so that it consisted merely of a capsule $\frac{1}{4}$ in. thick of fibromuscular tissue, while the interior was soft and cheesy in consistence. Patient made an uneventful recovery, and was delivered at term of a living child.

An Ovarian Dermoid Cyst expelled through the Rectum during Labour.

By Victor Bonney, M.S.

The specimen came from a case in which a practitioner attending a woman in labour applied forceps to the head on account of delay. After making traction for some time he relinquished his hold, and, leaving the forceps still on the head, went across to the other side of the room. Returning to continue the forceps traction he found to his surprise a cyst (which on opening proved to be dermoid) lying on the bed. He was quite at a loss to account for its appearance, for examination both *per vaginam* and *per rectum*, after he had delivered the child, revealed no rent or tear in either canal. The patient rapidly developed symptoms of acute general peritonitis, and was removed to the Chelsea Hospital for Women, under the care of Mr. Victor Bonney.

On the abdomen being opened a hole was found in the anterior rectal wall about 1½ in. above the floor of Douglas's pouch. General peritonitis was present, the lower part of the peritoneal cavity containing much stinking pus. On account of the patient's grave condition only a cursory examination as to the site of origin of the tumour was possible, but both ovaries were found to be present. The uterus contained a fibroid of considerable size, and owing to this and the great abdominal distension, access to the rent in the rectum for the purpose of suture was impossible. Mr. Bonney, therefore, proceeded to suture the edges of the broad ligaments and the back of the uterus to the posterior pelvic brim so as to entirely exclude the pelvis from the rest of the peritoneal cavity, leaving it to drain by the hole in the rectum. Tubes were then inserted through the parietal wound to drain the rest of the abdomen.

The patient recovered from the operation but subsequently developed paralytic obstruction with great distension and fæcal vomiting. Jejunostomy was performed with immediate relief. The opened loop of gut was subsequently excised, and the continuity of the bowel restored by end-to-end union, and the patient left the hospital quite recovered.

Expulsion of an ovarian cyst in front of the head in labour is a very rare event. Haultain, at the Edinburgh Obstetrical Society in January, 1902, reported a case in which a dermoid cyst had been driven through the posterior vaginal vault, and quoted four similar cases from literature. He also stated that he had found recorded six cases in which a cyst had been driven through the rectum, but gave no references. In the case now published the tumour had undoubtedly lain under the head in the pouch of Douglas, and had been forced into the rectum as the head was pulled down. Its actual expulsion from the rectum must have been the result of a voluntary expulsive effort on the part of the patient during the short interval during which the practitioner had relinquished the forceps. A further point of considerable interest is the fact that though the wall of the cyst shows the structure of ovarian tissue both ovaries appeared intact at the operation. The cyst which presented a definite pedicle must therefore have been derived from an accessory ovary.

An almost identical case is reported by Michaelis in the *Zentralblatt für Gynäkologie*, 1914, xxxviii, p. 154, and is epitomized in the *British Journal of Obstetrics and Gynæcology* for February, 1914. This patient also developed post-operative obstruction. Entero-enterostomy was performed, but she died. The literature bearing on the subject will be found in this article.

Uterus showing Squamous Cell Carcinoma of the Cervix and Adeno-carcinoma of the Body.

By VICTOR BONNEY, M.S.

THE specimen shown consisted of the uterus and its appendages, together with the whole vagina and urethra. It was removed by operation from a patient who had only exhibited symptoms of malignant disease of the uterus for a comparatively short time in spite of actual advanced condition of the growths.

The specimen shows three distinct areas of malignant growths as follows:—

(1) A soft fungating mass occupying the body of the uterus in its upper part and which, microscopically, presents the features of columnar cell adeno-carcinoma.

(2) A diffuse infiltrating growth of the cervix which, microscopically, is a typical squamous cell carcinoma.

(3) A nodule the size of a walnut partly surrounding the urethra. This growth shows squamous cell carcinoma and is secondary to the

growth in the cervix. A few small fibroids of the corpus are also present.

Double malignant growths of the uterus are exceedingly rare. Logan Taylor and J. Teacher record three examples in the *Journal of Pathology and Bacteriology* for October, 1909. Archibald Leitch in the same issue reported a remarkable case in which adeno-carcinoma and squamous-cell carcinoma were found existing side by side in the multiple metastases found post mortem in a patient who died some time after her uterus had been removed for malignant disease. Information as to the nature of the primary growth was not obtainable.

Hernia into the Umbilical Cord.

By Victor Bonney, M.S.

The specimen consisted of the umbilical cord on which about 1 in. from the umbilicus was situated a cystic swelling rather larger than a cricket ball. This cyst contained the major portion of the child's intestine attached to its inner surface by a short mesentery and it communicated with the peritoneal cavity by a narrow neck traversing the short length of cord that intervened between the cyst and the umbilicus. The practitioner attending the labour had ligatured and divided the cord between the cyst and the umbilicus, not realizing that the cyst contained intestine.

The child was seen by Mr. Victor Bonney twenty-four hours after its birth. Its facies was "pinched," but otherwise it appeared fairly vigorous. In the stump of the cord the two cut ends of the intestine were visible. Novocain was injected round the umbilicus, the ligature removed and the opening into the abdomen slightly enlarged. After a few small vessels in the mesentery had been ligatured, the two ends of the bowel were joined together by end-to-end anastomosis, after which the umbilicus was closed by sutures. The child's condition remained unchanged by the operation, but twelve hours afterwards it suddenly expired. A post-mortem examination showed that nearly all the intestine had been removed with the hernia sac, the operation having effected a junction between the top part of the jejunum and the lower end of the pelvic colon.

The specimen was shown for its clinical interest. Most herniæ into the cord project directly from the umbilicus and the intestine in them can be seen through the wall formed of the thinned-out cord. In the much rarer form now recorded a short length of normal cord intervened between the sac and the umbilicus and the sac itself was distended with fluid (hydrocele of a cordal hernia sac), so that the presence of intestine in it could not be seen. Under such circumstances the liability for a practitioner to misinterpret the nature of the cystic swelling on the cord was considerable. In the event of intestine being cut away under such a mistaken diagnosis the right treatment is to anastomose the gut, although in the case now reported the amount removed, as it subsequently turned out, precluded the possibility of thus saving the child's life.

Dr. BLACKER pointed out that cases had been recorded in which the umbilical ring was constricted and formed a species of pedicle for the hernia. Ahlfeld had recorded such a case in which the proximal portion of the hernia had undergone shrinking and constriction, and the intestine contained within it, consisting of a part of the cæcum, the vermiform appendix, and the terminal part of the jejunum, had become entirely cut off.[1] Ahlfeld quoted Dithmar as having recorded a somewhat similar case.

Myomatous Uterus removed immediately after Labour.

By R. DRUMMOND MAXWELL, M.D.

THIS specimen from Queen Charlotte's Hospital, which shows a large undegenerate interstitial fibromyoma—roughly, a sphere with a diameter of 6 in., occupying the fundus of the uterus—was not detected prior to and in no way complicated a spontaneous delivery of a full-time living child. The large size of the uterus after the second stage led to its discovery and suspicions that the case was one of multiple pregnancy. Free bleeding ensued after the placenta was expelled, and on the introduction of the hand into the uterus a large mass (the placental site) was felt bulging into the cavity, and Dr. Maxwell was summoned to see the case and confirmed the observation that the mass was probably a fibroid. The age of the patient, 23 years only, was, however, felt to be a point very considerably against the diagnosis. The intra-uterine examination was associated with considerable bleeding, and it was felt that an expectant policy was not justified in the presence of such free loss of blood.

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[1] Ahlfeld, *Archiv f. Gyn.*, Berl., 1873, v, p. 232.

The abdomen was opened by a 6-in. paramedian incision extending 2 in. above the navel, and the uterus and tumour readily delivered. After momentary deliberation as to whether myomectomy or hysterectomy would best meet the case, the latter operation was decided on, influenced largely by the fact that the patient had already lost very considerably, although it was felt most regrettable that the uterus of so young a patient should be sacrificed.

The uterus and tumour were incised some days later after the specimen had been hardened. Several points can be learnt from a more thorough examination of the sectioned specimen, points which could not be accurately determined at the time of operation. The first is the relation of the placental site to the fibroid. The bleeding *post partum* is easily explained, since the placental site is in the larger part of its area situated directly on the relatively non-retractile capsule of the fibroid. On this point one is glad that expectant treatment was decided against. The second is that such a fibroid might undoubtedly have been enucleated, and probably with great ease. Such enucleation would possibly have laid bare the uterine cavity, but this additional complication (if complication it be) need not have deterred one from a myomectomy, since the gap in the uterus would have been an exact counterpart of a fundal incision for a Cæsarean section, and, like it, easily sutured. The point of greatest interest is, however, this: What would have been one's treatment of this case in a private house with no facilities for immediate operation? Most probably the expectant attitude would have been adopted, with the above-mentioned risk of persistent bleeding. On the other hand, it is possible that with expectant treatment the bleeding might not have continued, in which case a myomectomy later in the puerperium might have led to a happier result, for there is no evidence in the specimen that necrobiotic change would have forced the operator's hand to act earlier than the end of the first week after the labour.

Defective Ossification of Fœtal Skull.

By R. Drummond Maxwell, M.D.

This case illustrates a typical malformation of the cranial vault—a large gap extending between the two halves of the frontal bone reaching to the glabellum. The area of defective ossification is elliptical and roughly represents an oval with a long axis in the sagittal plane of 3½ and a shorter axis at right angles of 2¼. Its bony edges are rough and spiculated. The interval is closed over by a tough membrane consisting of pericranium on the outer aspect and dura mater on the inner. Although to the sense of touch there is no obvious ossification, sections of this membrane show compact bone covered on each surface by fibrous tissue showing coarse fibrillation. The bone is dense in texture, and Haversian systems are few in number.

The condition is evidently one of cranial dysostosis, though the sections would lead one to believe that normal ossification of this membrane might have ensued had the child survived. There is no associated defective development of the clavicles (similarly developed in membrane) as seen in the well-recognized cranio-cleido dysostosis.

The case was shown owing to certain circumstances relating to the delivery of the head that led to a mistake in diagnosis. The maternal pelvis was slightly flattened and a difficult second stage ensued. Fœtal embarrassment called for forceps extraction. The forceps was applied to the head lying in the transverse diameter of the pelvis, with the result that an antero-posterior grip of the head was obtained, the anterior blade of the forceps lying immediately over the area of defective ossification, as shown by a superficial pressure mark left on the skin. Extraction was not difficult. The child at birth had marked exophthalmos and a typical cerebral whining cry (characteristic of meningeal irritation), associated with the above-mentioned gap in the vault, whose edges felt sharp and splintered. There seemed little doubt that one was dealing with a depressed fracture of the vault, and two hours after birth the scalp was reflected and the edges of the depression explored. This, however, only revealed the condition present, defective ossification and no trace of fracture. The infant only survived thirty hours after the operation. The case points to the fact that not only at the edge of a cephalhæmatoma may one obtain physical signs most suggestive of a depressed fracture, but also at the edges of an area of defective ossification, though in this latter case the diagnosis was complicated by a faulty forceps grip directly pressing on the affected area.

Case of Chorionepithelioma with Unusual Features.

By Herbert Williamson, M.D., and Charles Noon, M.D.

The patient from whom the specimens shown to-night were removed was a woman, aged 39, the mother of two children. After the birth of her last child, in 1907, the menstrual periods continued quite regular until November, 1911, when they ceased. In February, 1912, after three months' amenorrhœa, she was delivered of a vesicular mole; the delivery was spontaneous and apparently complete. She remained in bed for a fortnight, and during this time there was no excessive bleeding and no rise of temperature. Towards the end of March, 1912, she became ill, with a raised temperature and abdominal pain, and six weeks after the expulsion of the mole an abscess was opened and drained *per vaginam*. By the beginning of July, 1912, she was again quite well. From this time her periods were regular and normal until April, 1913, when they again ceased, and she was in doubt as to whether she had become pregnant; she, however, remained in good health until July. In July she had a sudden attack of abdominal pain and became ill, with loss of appetite, occasional vomiting, constipation, and gradual loss of weight. The abdominal pain continued, and was so severe as to keep her awake at night. In the course of a few days she began to be troubled by a cough, and on August 2 coughed up some frothy, blood-stained mucus. She was sent up to St. Bartholomew's from Barnstaple on August 4, and during the railway journey had a further slight hæmoptysis.

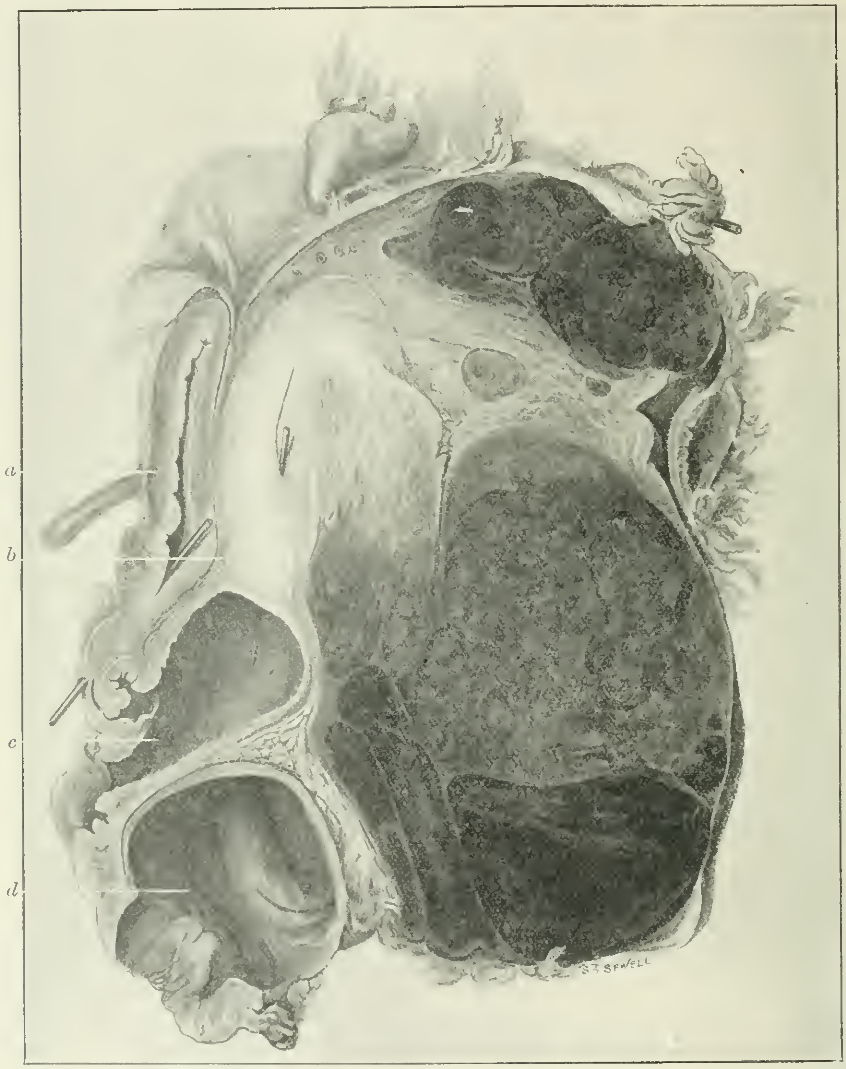
Condition on Admission to Hospital.—She was a spare woman, but not emaciated; the conjunctivæ were yellow, and the skin jaundiced. Temperature 99° F., pulse 108, respirations 40 to the minute, tongue furred and dry. No enlarged glands were felt in the supraclavicular triangles, the groins or axillæ. The breathing was shallow, the movements of the left side of the chest impaired, the percussion note was dull, and the breath sounds weak at the left apex and over the lower half of the right lung. The abdomen was distended below the level of the umbilicus, but moved well on respiration; a tumour could be felt rising out of the pelvis, and extending for a distance of 7 in. above the top of the pubes. It was centrally situated, elastic, and its outline rather difficult to define; it was a little tender to the touch, and its mobility was slight. It could not be made to contract, the note over it was impaired, but not absolutely dull, and a very clear souffle could be heard over its right upper border. There was no tenderness over the liver, and the area of liver dullness appeared to be natural. On vaginal examination the cervix lay close behind the symphysis pubis, high up and difficult to reach, the canal was closed, the cervical tissues were not softened. The posterior fornix was bulged downwards by a rounded, tender, elastic mass, which occupied the greater part of the pelvic excavation; the mass was fixed, but the vaginal mucosa could be moved over it. Bimanual examination was difficult, on account of tenderness, but the uterus could not be differentiated from the tumour. On rectal examination, the tumour was found to encroach upon the lumen of the bowel, but the mucosa was healthy and moved freely over the mass. There was no œdema of the legs. The urine contained bile, but no albumin or other abnormal constituents. A blood examination gave a count of 3,500,000 red and 10,000 white cells.

The diagnosis offered points of difficulty. The sudden onset of amenorrhœa in a woman whose periods had previously been perfectly regular suggested pregnancy, and this view was supported by the presence of a loud souffle heard over the upper part of the tumour, but the absence of signs of activity in the breasts, the absence of contractions over the tumour and of softening of the cervix were against it, and we formed the conclusion that the patient was suffering from some form of pelvic new growth with secondary deposits in the lungs and liver. We therefore sent her to the X-ray department for a report on the condition of the chest, and the skiagram showed many dark areas which were interpreted to represent deposits of growth in both lungs.

The next question to be settled was the nature of the growth. The history of the expulsion of a vesicular mole raised the suspicion of chorionepithelioma, but the fact that seventeen months had intervened, and that during the greater part of this time the patient had been in good health, made this appear somewhat doubtful, and we asked Mr. Mackenzie Wallis to test the blood serum by Abderhalden's method for both pregnancy and carcinoma. With placental tissue the result was strongly positive by both the ninhydrin test and the optical method; with carcinoma tissue the result was negative. We therefore made a confident diagnosis of chorionepithelioma.

There is but little to be added to the clinical history. She gradually became weaker, respiration became more and more embarrassed, and she died on the twentieth day after admission.

The first specimen (*see* figure) shows the mass of growth which occupied the pelvic cavity and lower part of the abdomen; it has been hardened in formalin for several weeks. The specimen consists of the growth together with the bladder, uterus, vagina, rectum and pelvic colon; one kidney and ureter are still attached. At the post-mortem examination



Specimen from case of chorionepithelioma. *a*, bladder; *b*, uterus; *c*, vagina; *d*, rectum. (× $\frac{2}{3}$.)

the ureters were bound intimately to the lateral aspects of the mass and compressed between it and the pelvic walls, but they were easily isolated by dissection, and their tissues were not infiltrated. The cæcum and appendix were fixed by adhesions to the growth, but their walls were not invaded. The bladder, seen on the anterior aspect of the specimen, shows some degree of hypertrophy, but in other respects is normal; a red glass rod has been passed through the urethral canal. The lower portions of the ureters appear normal, but the portions above the spot where they were compressed between the growth and the pelvic wall are dilated and hypertrophied, as are also the pelves and calyces of the kidneys. The pelvic colon and upper part of the rectum are stretched over the growth, but are not infiltrated. The vaginal wall is smooth and not infiltrated. The uterus is bisected a little to the left of the median line; its general outline is preserved except posteriorly, where it is thickened and infiltrated by the growth. The cavity is neither dilated nor elongated; the mucosa is smooth, and neither to the naked eye nor microscopically is any growth visible. Behind the uterus is a mass, measuring 7 in. in the vertical diameter and 4 in. antero-posteriorly; before removal from the body it filled up the pelvic excavation and reached 4 in. above the brim. It consists of three portions: (1) An upper part of a red colour with well-defined margins; (2) a medial triangular portion of a pale grey colour with a central red nodule; and (3) a lower portion, larger than either of the others, of a red colour, and having ill-defined margins; in the lower pole of this portion is a mass of blood-clot adherent to the growth. The external surface of the growth is bossed and irregular; both round ligaments can be identified—that of the left side passes into the growth, but the left ovary and tube cannot be seen. The right round ligament can be traced on to the surface of the growth, and the right ovary and tube are seen slightly above and posterior to it. These structures are of natural size, and, although adherent to the growth, are not infiltrated.

The liver was enlarged, and scattered over its surface were a number of raised, dark red masses of growth. The section of liver shown contains three such masses, the largest measuring 2 in. in diameter; they are not encapsuled, but the line of demarcation between them and the liver substance is clearly marked. Both lungs are studded with masses of growth varying in size from a pea to a marble. These are well seen in the portion exhibited. Sections prepared from the wall of the uterus, the lungs, and the liver show that the growth consists chiefly of masses and strands of syncytium, so arranged as to form the boundaries of irregular vascular spaces, but in some sections Langhans's cells are present in large numbers. The nuclei are, for the most part, vesicular, but in some of the thinner strands they are elongated and almost rod-shaped. An area of apparently healthy tissue intervenes everywhere between the growth and the uterine mucosa. Sections have also been cut from the kidney, the uterine mucosa, and from the blood-clot, but none of these contain growth.

We have shown this specimen to-night mainly to illustrate the value of Abderhalden's test in the diagnosis of chorionepithelioma. At a meeting of this Section some months ago[1] we emphasized the importance of performing Abderhalden's test at regular intervals upon all patients who had recently been delivered of a vesicular mole, and expressed the opinion that this afforded a means of making the diagnosis of the development of chorionepithelioma at the earliest possible moment. It was objected that clinical evidence was more reliable, and that the only way of making a certain diagnosis was by dilating and exploring the uterine cavity. In this case exploration of the uterine cavity would have been of no value whatever, for, as often happens in these cases, the primary growth was not in the uterine mucosa. It is impossible to say where the growth started; it may have been in the left ovary or tube, or possibly in the depths of the uterine muscle. Had we had this patient under observation after the expulsion of the mole, and had Abderhalden's test given a persistently positive result, we should have felt it our duty to have explored the abdomen, and her life might have been saved.

The case presents other features of clinical interest in the long interval of sixteen months between the expulsion of the mole and the onset of symptoms, and in the fact that menstruation was regular in time and normal in amount for a period of one year, during which the growth was developing.

DISCUSSION.

Dr. LUKER said that there had recently been a case in the London Hospital under the care of Dr. Andrews which closely resembled Dr. Williamson's case in many points. The patient, aged 32, expelled a hydatidiform mole in May, 1913. Two months later she returned for curettage and the sections showed normal endometrium. In October, 1913, she was admitted again with a history of general ill-health and constipation, frequency and difficulty in micturition, and pain in back. Catamenia: After leaving hospital in June, 1913, one or two normal periods occurred; after this there was no bleeding at all from the uterus. On examination of the pelvis nothing abnormal could be detected. There was a moderate degree of pyrexia. There was some dullness at the base of the right lung, and a small amount of blood-stained fluid was withdrawn with an exploring needle; endothelial cells were present in this fluid. The pulmonary symptoms soon subsided. Examination of the urine showed a small amount of pus and *Bacillus coli*. Retention of urine followed later, and a cystoscopic examination showed subacute cystitis. In view of the absence of symptoms and signs in the uterus the diagnosis of the case was difficult and several other possibilities were considered. A blood count showed 2,000,000 red corpuscles and 9,000 white corpuscles. Widal's reaction was negative. Blood cultures were sterile. On January 1, 1914, eight months after the molar pregnancy was terminated, the patient suddenly lost consciousness and died in a short time. Post mortem a mass of growth was found in front of the sacrum, involving the sacral nerves. The uterus, cervix and vagina were unaffected. Deposits of chorionepithelioma were found in the lungs, liver, spleen, pancreas, ovary, and brain.

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[1] *Proceedings*, p. 40.

Dr. ARCHIBALD LEITCH said that, in addition to the last case which Mr. Victor Bonney had kindly given him the opportunity of examining, he had previously had experience of the Abderhalden test in another case of chorionepithelioma. In the latter the serum had given a positive reaction, though at the time no suspicion existed as the real nature of the condition, but on cutting into the removed uterus afterwards a chorionepithelioma smaller than a walnut in size was found. Twenty days after the operation the serum still gave a positive reaction. A month later again the reaction was even more pronounced, and yet no symptoms whatever had supervened pointing to the presence of metastases. On that account, and from other experiences that shook his faith in the diagnostic value of the reaction for pregnancy, he thought it would be unsafe to rely on the findings in prospecting for chorionepithelioma. He had investigated these cases by the dialysation method, which he believed to be the better of the two methods adopted by Abderhalden. According to Abderhalden the findings by the two methods always agreed. The polarimetric method was open to several objections, two of which he might mention. In the first place, the amount of rotation produced by placental peptone plus pregnant serum was very small in most cases and probably not beyond the error of the "personal equation." In the second place, it had been shown that the serum of an animal will always degrade the peptones, not only of its particular, but also of allied, species. Consequently a human serum, quite apart from the question of pregnancy, would act on human placental peptone so as to produce optical rotation in the polarimeter. If the serum of a pregnant case produced much greater rotations it might be possible arbitrarily to fix a point differentiating a pregnant from a non-pregnant serum, but the rotation in any case was small, and the arbitrary point could only be expected to divide average cases. He distrusted its practical value even more than that of the dialysation method.

Heart Disease complicating Pregnancy; Cæsarean Section under Spinal Anæsthesia.

By J. Barris, F.R.C.S.

The management of pregnancy and labour complicated by severe cardiac disease is a matter fraught with grave dangers to the patient. Some patients do unexpectedly well when treated by the usual methods of rapid delivery under light general anæsthesia; many, however, do not, and in severe cases of cardiac disease a general anæsthetic is contra-indicated.

I was so much impressed by the satisfactory results obtained by means of Cæsarean section under spinal anæsthesia in a case which occurred recently in the Maternity Department of St. Bartholomew's Hospital, that I venture to bring the case before your notice, together with such others as I have been able to collect.

Case I.—E. R. (registered number 865) was admitted to St. Bartholomew's Hospital on October 4, 1913. The patient was a multipara who had had ten previous labours, the last in April, 1910. There had been no return of the periods since the last pregnancy. The patient gave a past history of rheumatic fever in 1901 and again in 1910 immediately before the birth of the last child. At the last labour there were no signs of cardiac failure, but she had suffered from shortness of breath since. The patient was at first admitted to Mary Ward under the care of Dr. Herringham. At this time there was dyspnœa (marked); she was livid, cold, and covered with a profuse sweat. The pulse was completely irregular and was uncountable. The heart was greatly dilated, and the urine contained albumin. Venesection was performed and digitalin given when her condition improved. Four days later, however, she had a similar attack of cardiac failure. As the patient was pregnant she was transferred to the Maternity Ward on October 22, when she was under the care of Dr. Williamson until the end of the month. She then passed under my own care in November, as it was my month to be on duty. The patient at this time looked cyanosed and ill and suffered from dypsnœa and vomiting on the slightest exertion; the urine contained albumin, and the tissues of the back in the lumbar region were œdematous. The heart was markedly dilated, the area of cardiac dullness reached up to the third rib of the left side and 1½ in. from the right of the sternum in the right fourth interspace; the apex beat was in the sixth space 5½ in. from the middle line. A thrill systolic in time could be felt over the apex. Auscultation revealed at the apex a systolic murmur conducted into the axilla, and a local mid-diastolic murmur;

at the aortic base a systolic murmur not conducted into the neck, and a faint diastolic murmur. Pulsation could be seen in the jugular veins. The pulse was very irregular in time and volume. An electrocardiogram taken by Dr. Cumberbatch showed evidence of auricular fibrillation and disorganization of the ventricular muscle. It was difficult to estimate the date of the pregnancy as there had been no period since the last pregnancy in April, 1910, but the size of the uterus corresponded with the twenty-seventh week of gestation. The fœtal heart could be heard in the left occipital anterior position. As the child was not yet viable, I was anxious to prolong the period of pregnancy as long as possible, provided the mother's condition permitted it. Accordingly Dr. Herringham was asked to see her again to advise whether delay was justifiable. He stated that in his opinion the pregnancy ought to be terminated immediately. I was fortunate in obtaining the assistance of our President, Dr. Griffith, who advised that the pregnancy should be terminated by Cæsarean section. I therefore determined to perform Cæsarean section under spinal anæsthesia, for the following reasons: (1) To practise rapid delivery some form of anæsthesia was necessary. (2) A general anæsthetic was contra-indicated owing not only to the valvular lesions, but to the condition of the cardiac muscle; therefore, some special method such as local or spinal anæsthesia was indicated. (3) Abdominal Cæsarean section was preferred to vaginal on account of the size of the child, and also because by the abdominal route one could remove a portion of both tubes and so protect the patient by rendering her sterile.

Operation: The patient was placed in the sitting position and 0·1 grm. stovaine and 0·05 grm. dextrose dissolved in 1 c.cm. sterilized water were injected between the third and fourth lumbar vertebræ by Mr. Trewby. Satisfactory anæsthesia was not obtained until twenty minutes had elapsed, accordingly another 1 c.cm. of the solution was injected. Full anæsthesia followed in a few minutes. Mr. Trewby noted that the probable cause of the delay in the action of the first injection was that the patient had marked lordosis as a result of the pregnancy, and this caused the stovaine to gravitate downwards. He placed a sandbag under the pelvis and directed that the knees should be drawn up. This manœuvre was completely successful. The operation was then performed rapidly in the usual manner, and the patient was sterilized by the removal of a portion of both Fallopian tubes. During the course of the operation 1 c.c. pituitary extract was injected and oxygen inhalation administered. The patient bore the operation very well with the exception that she vomited immediately afterwards. During our manipulations her face was screened off; she felt no pain, and on inquiry we elicited no symptoms of mental distress. There was no evidence of shock; the blood-pressure, which was 240 mm. Hg at the commencement of the operation, only fell to 160 (blood-pressure tracing was here shown). The pulse remained of good volume—the rate was 90 beats to the minute immediately before the operation and it fell to 55 at the end; half an hour later it was 75; the uterus contracted well and there was no undue loss of blood. The child was extracted alive and breathed naturally directly it was born. At the close of the operation a sandbag was placed on the abdomen in order to maintain the intra-abdominal pressure; the anæsthesia continued for one hour. The patient made an uninterrupted recovery.

Case II.—The earliest case that I have been able to discover was reported before the North of England Obstetrical and Gynæcological Society on January 20, 1911, by Dr. Walls, under the title of "Cæsarean Section under Spinal (Stovaine) Anæsthesia, undertaken on account of Mitral Stenosis and Kidney Disease, which rendered the Patient a Bad Subject for General Anæsthesia." The operation was performed by Dr. Watts when the patient was about eight months pregnant, as there was great dyspnœa, accompanied by marked waterlogging of the lungs, general œdema and a large amount of albumin in the urine. The patient made a good recovery, and her general condition was greatly relieved. The baby was born alive.

Case III.—In the *Journal of Obstetrics and Gynæcology*, vol. xx, p. 60, there is a case reported by Dr. James Wyatt. The patient was admitted to St. Thomas's Hospital under the care of Dr. Fairbairn. On admission she was found to be in the sixth month of pregnancy and the heart was markedly dilated. She was kept under observation in hospital until within a fortnight of full term. During this time her condition had improved, but there had been two attacks of cardiac failure. Dr. Fairbairn decided to perform Cæsarean section under spinal anæsthesia; 1·6 c.c. tropacocaine with adrenalin were injected into the spinal canal between the second and third lumbar vertebræ (the skin having been previously cocainized), and within a few minutes there was complete anæsthesia from the subcostal line downwards. A living child was obtained. The patient was sterilized by the removal of a portion of each Fallopian tube. During the operation the patient vomited, but her condition otherwise was good. She progressed favourably for three days, but died on the fifth day from cardiac failure.

The author states that there is no doubt that this case could not possibly have gone through a normal labour, even if induction had been done, and although, unfortunately, the patient died, it was not the result of the operation; and possibly, if this had been performed a few weeks earlier, a more favourable result might have been obtained.

Case IV.—Dr. Stabb performed Cæsarean section under spinal anæsthesia upon a patient at Queen Charlotte's Hospital in December, 1913. He was kind enough to invite me to be present at the operation and also to allow me to record the case. The patient was a primigravida, aged 24, in the thirty-fifth week of pregnancy. There was a past history of rheumatic fever at the age of 14. On admission she had dyspnœa and palpitation; the urine contained albumin, and there were signs of double mitral disease; 0·8 c.c. stovaine was injected into the spinal cord and within ten minutes anæsthesia was obtained; during the operation a small amount of gas and oxygen were also administered. The operation was rapidly performed, and a living crying child extracted. The uterus contracted well, and a portion of both Fallopian tubes was removed. The patient showed no evidence of shock and made a good recovery, but the child died eight days later from broncho-pneumonia.

Case V.—Kreiss, in the *Zentralblatt für Gynäkologie*, 1914, xxxvii, p. 1805, in an article upon "Heart Disease and Pregnancy," mentions a case treated by Cæsarean section under spinal anæsthesia. No particulars of the case are given, but he recommends this treatment in severe cardiac disease, and he prefers the abdominal method to the vaginal.

In forming an opinion as to the value of the method of treatment by Cæsarean section under spinal anæsthesia there are certain points to be critically considered. In the first place it must be admitted that some cases of cardiac disease pass through labour unexpectedly well, apart from this treatment. On the other hand, the method has the merit that delivery is effected with great rapidity, for the operation need not take a long time, it can be completed within twenty minutes. Thus the strain upon the cardiac muscle during the first and second stages of labour may be entirely avoided, thereby diminishing the risks both of cardiac failure and of embolism. A further important consideration is that the patient can also be sterilized and so protected from the dangers of further pregnancies. Again, the method does not appear to predispose the uterus to inertia, the uterus contracts well. In order to facilitate this 1 c.c. of pituitary extract may be given immediately before making the abdominal incision. Nor does the child appear to run any risk from asphyxia, it usually cries immediately after extraction. These last two points are well known; thus Polano has recorded in the *Münch. med. Wochenschr.*, 1908, p. 1178, six cases of Cæsarean section under spinal anæsthesia performed on account of contracted pelvis, and in all the uterus contracted well and the child was born alive without asphyxia. The question as to the degree of shock resulting from the manipulation is an important one. In my own case the blood-pressure fell only 80 mm. during operation, and it continued to fall for about half an hour after the operation, but it never fell below 100. Dr. Donaldson has observed a drop in the blood-pressure in cases of Cæsarean section also when performed under general anæsthesia. Here is the blood-pressure chart of a case of Cæsarean section under general anæsthesia undertaken on account of fibroids. This chart and the one previously shown both differ from the normal in the drop of pressure soon after the child is extracted and the uterus is brought out of the abdomen. Whether this drop in pressure is cardiac in origin or due to local manipulations causing a lowered splanchnic resistance Dr. Donaldson is unable to say, but he is of opinion it is not due to the removal of the intra-abdominal pressure, for it does not happen in normal deliveries. No undue amount of shock was observed in the cases recorded to-night, nor in Polano's cases to which reference has already been made.

A possible drawback to the method is the mental effect upon the patient if she is fully conscious. This can, however, be greatly minimized by administering morphia or scopolamine before the operation, and by cocainizing the skin prior to the injection of the spinal anæsthetic.

No final and lasting conclusions can be deduced from this one case which I have reported, and from the four others which I have been able to collect and to place before you. I wish to state only the results in these particular cases, and so far they have proved encouraging. When further cases have been recorded a better opportunity of forming a more definite opinion will be given; in the meantime, I bring these forward in order to focus opinion upon this method as a possible alternative to that usually adopted, and as a contribution to our knowledge of the subject.

A Case of Superior Recto-vaginal Fistula dealt with by the Abdominal Route after Preliminary Colostomy.

By T. Watts Eden, M.D.

The history of the case which I have to relate is as follows: Mrs. P., aged 38, 6-para, was admitted to the Chelsea Hospital for Women on July 27, 1910, under the care of Mr. Stanley Dodd. She had been confined eight days before admission, and, according to the account given by her medical attendant, a small tumour had presented at the vulva after the delivery of the child by forceps; a portion of the tumour was cut away at once—it appeared to be attached to the uterus. Nothing abnormal occurred until the eighth day, when she had a rigor with a sharp rise of temperature, and was sent into the hospital at once.

On admission her temperature was 101·4° F. and her abdomen was distended and tender, the case being regarded as one of pelvic peritonitis. On vaginal examination it was found that the greater part of the posterior wall of the cervix had been torn away and was hanging in the vagina suspended from a narrow attachment. It was swollen and ulcerated. Behind the cervix was a deep laceration of the posterior fornix. The torn piece of cervix was cut away and the vaginal canal disinfected. She made an easy recovery.

In April, 1912, she was readmitted (this time under my own care) suffering from marked prolapse of both vaginal walls and retroversion of the uterus. In other respects her health was good, and there had been no further pregnancy. Anterior and posterior colporrhaphy were performed, and the uterus was suspended by the round ligaments.

On July 29, 1913, she was again admitted, suffering from a recto-vaginal fistula, the result of a recent confinement. The history of this confinement, gathered partly from herself and partly from her medical attendant, was as follows: She was confined in the third week in June, the labour having lasted thirty-six hours and having been terminated by forceps. She said that for the last six or seven hours of her labour the pains were strong. On inquiry, her medical attendant told us that when he applied forceps the head was well within reach and the delivery was easy. He was not aware that any injury had occurred. On the third day an aperient was given, and it was then seen that she had complete incontinence of fæces. After a further lapse of three or four days it was noticed that motions were passed entirely *per vaginam* and none *per anum*. Latterly a certain amount of fæcal matter had, however, been passed through the natural passage. Her general condition had been good since the confinement. On admission, pulse and temperature were normal and the urine was found healthy. Examination of the abdomen was negative. On vaginal examination an aperture was felt in the position of the posterior fornix through which the tips of two fingers could be passed. On exposing the cervix with the speculum, it was seen that only the anterior wall was present. The posterior wall was absent, and in its position was a large aperture opening into the rectum (fig. 1). The aperture was oval transversely, and its boundaries were formed by the vaginal wall behind and below, and by the posterior wall of the supravaginal cervix above and in front. The uterus being anteverted, the cervical canal appeared to open into the rectum. The uterus was fixed and could not be drawn down at all by traction on the cervix. The lower edge of the fistula had contracted, and the rectal mucous membrane at this point was thickened and everted. On rectal examination the opening into the vagina could be easily reached with the finger and a fair amount of scar tissue was felt, the mobility of the parts being very limited.

Clearly this was a very uncommon obstetric injury. Recto-vaginal fistulæ in the upper part of the vagina are extremely rare, except from malignant disease, and I had never previously seen a case like it. The cause was probably to be found in the injury which occurred at the fifth confinement, involving the loss of the posterior wall of the cervix. As a result, formation of scar tissue occurred in the posterior vaginal fornix which interfered with dilatation in the subsequent labour; and this obstacle, being unrecognized, was allowed to remain exposed to the pressure of the advancing head until it burst, widely involving the anterior rectal wall as well as the vagina. It appears very unlikely that the injury was caused by the forceps operation at the last confinement, as the medical attendant had no difficulty either in applying the forceps or in delivering the head.

I had to consider carefully what was the best means of dealing with a large fistula in this position. It will be most convenient to state first the methods adopted and later on to refer to the alternative methods which might have been made use of. Owing to its size and inaccessible position it was clear it would be very difficult to suture it accurately, whatever method was adopted, and I had to consider whether any

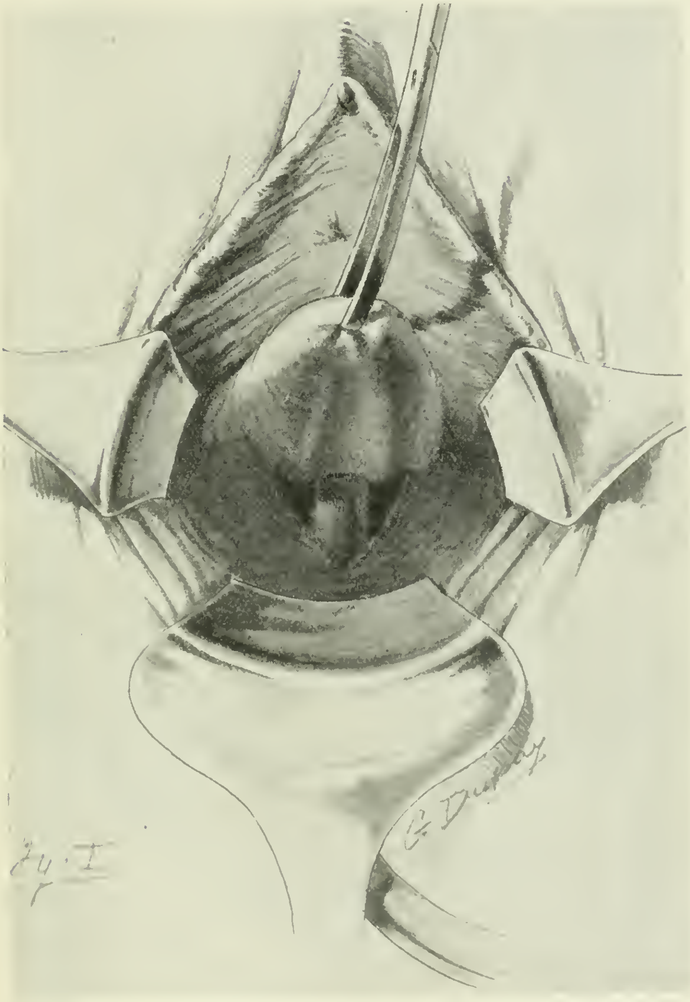

Fig. 1.

The fistula exposed *per vaginam*, and showing the rectal bougie in position.

Note.—The anterior cervical lip is disproportionately large, and its level too low in the drawing.

auxiliary means could be made use of to secure a successful result. I first decided to do a preliminary colostomy, feeling satisfied that with so large a fistula healing would be rendered much easier if the fæcal stream were cut off. Three days after admission I therefore stitched a loop of the pelvic colon to the abdominal wall by Wallis's method, and three days later it was opened by the cautery. The colostomy spur proved quite efficient and no difficulty was experienced in keeping the lower segment of the bowel clear. This was irrigated daily both from above and below with a weak alkaline solution and the fluid returned quite clear, except for a little mucus. I had some hope that as the result of the colostomy the fistula might close spontaneously, but, after waiting for three weeks, no sign of healing could be detected; the lower segment of the bowel became collapsed, but there was no appreciable change in the fistula.

After considering the relative advantages of the possible routes by which the fistula might be attacked, I decided to make use of the abdominal route for reasons which will be referred to later on.

On August 21 the operation was performed, beginning by carefully swabbing the vaginal walls and cervix with tincture of iodine. Then a rectal bougie was passed *per anum* until the point lay well above the fistula. This was found very useful later on when clearing the peri-rectal adhesions. The colostomy opening was then plugged and the bowel completely covered over with gauze and mackintosh, which were carefully stitched to the skin all round it. Gloves were now changed, and after thoroughly swabbing the whole of the abdominal wall with tincture of iodine, the abdomen was opened by a paramedian incision, avoiding the scar of the previous operation. I was interested to find that the position of the uterus had not been altered in any way by the pregnancy and labour which had followed it. The fundus was found loosely attached by its cornua to the parietes, the utero-vesical pouch was roomy and free and not a single uterine adhesion was seen. The cornual attachments were divided and the uterus was pulled up with Dartigue's forceps, exposing the pouch of Douglas. It was then seen that the floor of the pouch was obscured by extensive adhesions uniting the rectum to the cervix and vagina. The upper third of the rectum was quite free. I had previously decided, with the patient's consent, to remove the uterus, partly because it was desirable to prevent a future pregnancy and partly to permit freer access to the fistula. The operation then proceeded as for panhysterectomy, the cervix and vagina in front and at the sides being cleared as far down as possible. Both

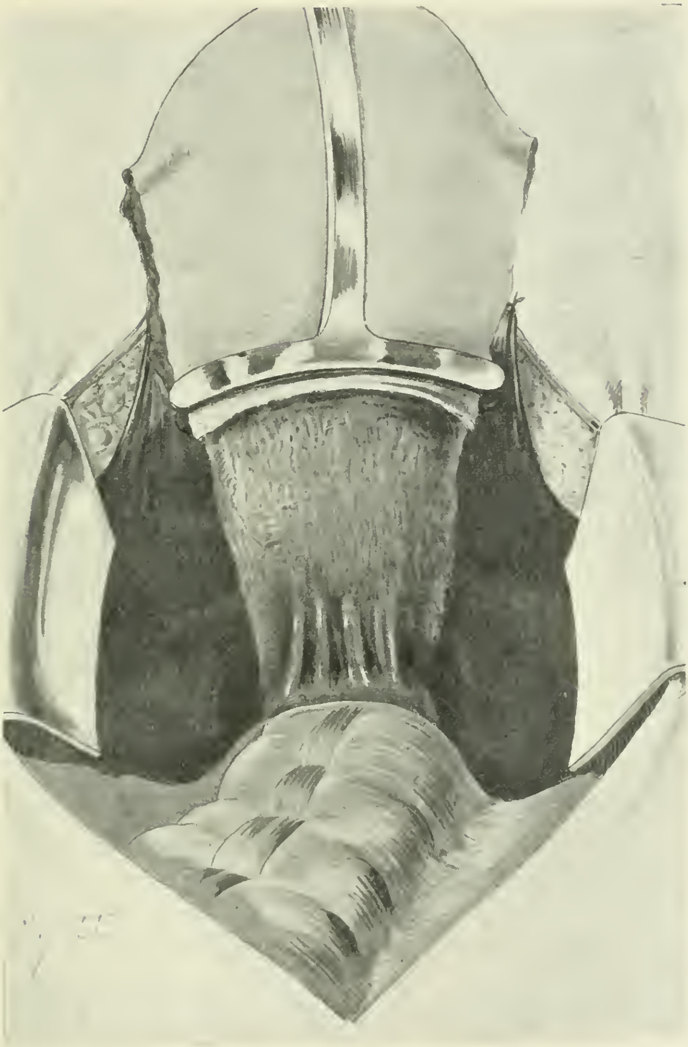

FIG. 2.

The Abdominal Operation.—The isolation of the uterus and the upper part of the vagina has been completed, and the floor of Douglas's pouch has been opened up. The adhesions immediately above the fistula have been exposed by pulling the uterus upwards. The anterior peritoneal flap has been stitched to the skin concealing the bladder.

ovaries were healthy and were not removed. The next step (figs. 2 and 3), the separation of the rectum from the cervix above the fistula, required time and patience, and then, the fistula having been laid open by the division of its upper margin, the lower margin was dealt with. This was the most difficult part of the operation and was ultimately effected by separating the rectum from the vagina below the level of the fistula with scissors and the finger, and then cutting through the intervening bridge of tissue, so as to leave most of the scar tissue attached to the vagina. The rectal wall was now free for about an inch below the fistula (fig. 4). The vaginal walls were next cut through at the level indicated in fig. 5. The cut edge of the anterior vaginal wall included part of the cervix and was much thicker than the posterior. With two pairs of dissection forceps traction was now made by an assistant on the lateral angles of the fistula, so as to approximate the edges transversely. Interrupted thread stitches taking up all the layers were then introduced, so that the resulting cicatrix would be transverse. There was not sufficient room to insert a second row of superimposed rectal stitches, so I divided the vagina at each side so as to form a flap of the posterior wall and stitched this to the rectal wall over the fistula, completely covering it in (fig. 6). There was a certain amount of traction on the vagino-rectal stitches, but those in the rectum itself were quite free from tension. The vagina was left open and the anterior peritoneal flap was then brought over and sewn to the rectum and the peritoneum on each side of it, completely peritonizing the pelvic floor once more (fig. 7). The abdominal wound was closed without drainage and covered with a collodion scab to protect it from the colostomy opening. The opened vagina provided an exit from the fistula should any defect in healing occur.

The operation took nearly two and a half hours and was followed by severe shock, but by the next morning she had rallied, and her recovery was never again in doubt. There was some pyrexia for the first week, the highest point reached being 101·2° F. On the seventh day a dark, offensive vaginal discharge appeared, and on examination of the abdominal wound pus was seen oozing from several of the skin stitches. These stitches were removed and under treatment with boracic fomentations the wound cleaned rapidly, and on the fourteenth day had entirely healed. Vaginal examination with the speculum showed that the offensive discharge issued from a point high up which could not be clearly seen. Digital examination *per rectum*, however, showed that the rectal stitches in the middle of the fistula had given way, leaving

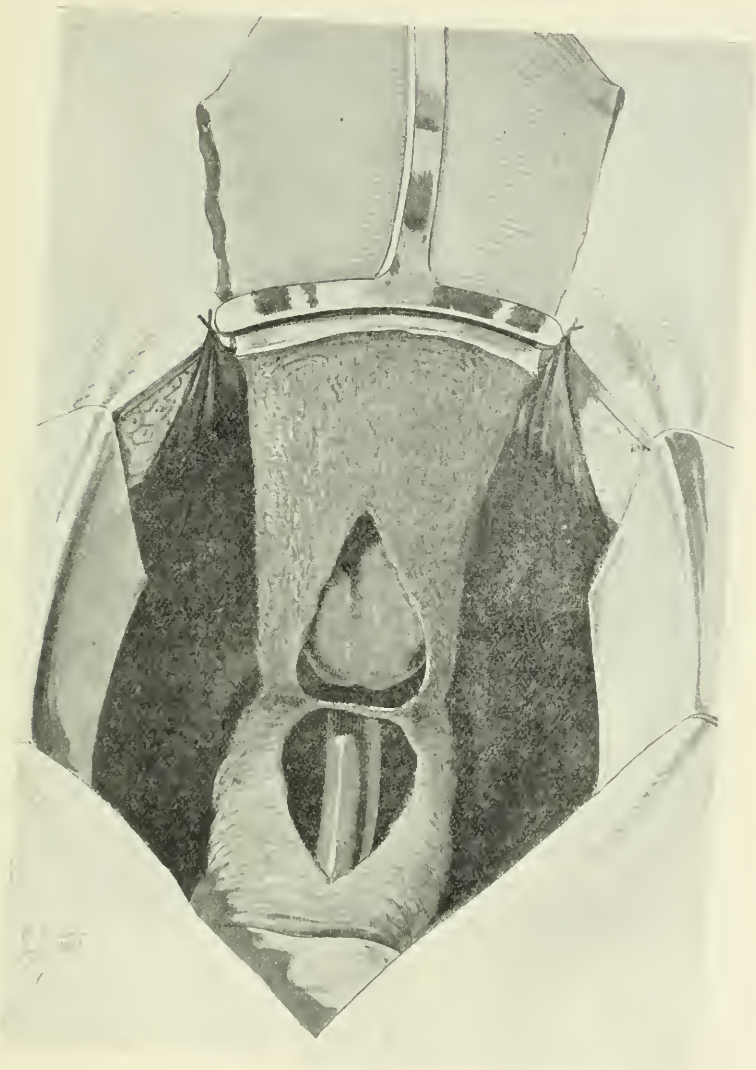

FIG. 3.

The dissection has been carried farther and the fistula has been divided in all but its lower border. The anterior cervical lip is seen through the opening in the vagina.

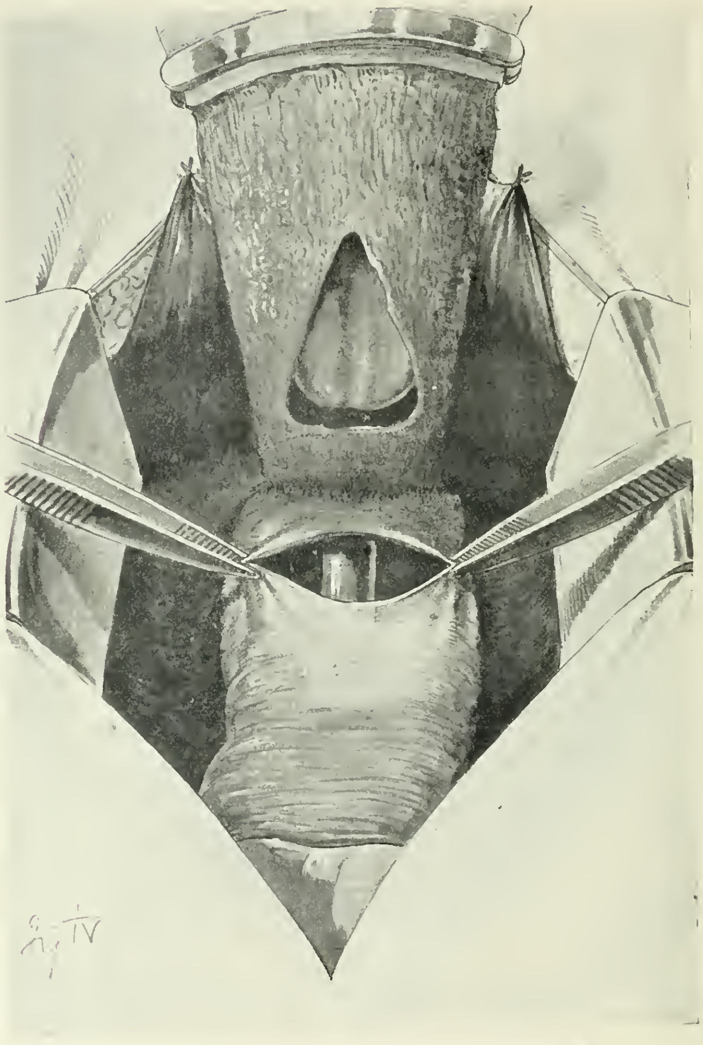

Fig. 4.

The lower border of the fistula has been divided and the rectum separated from the vagina for an inch further down. The lateral margins of the rectal opening are held by dissecting forceps.

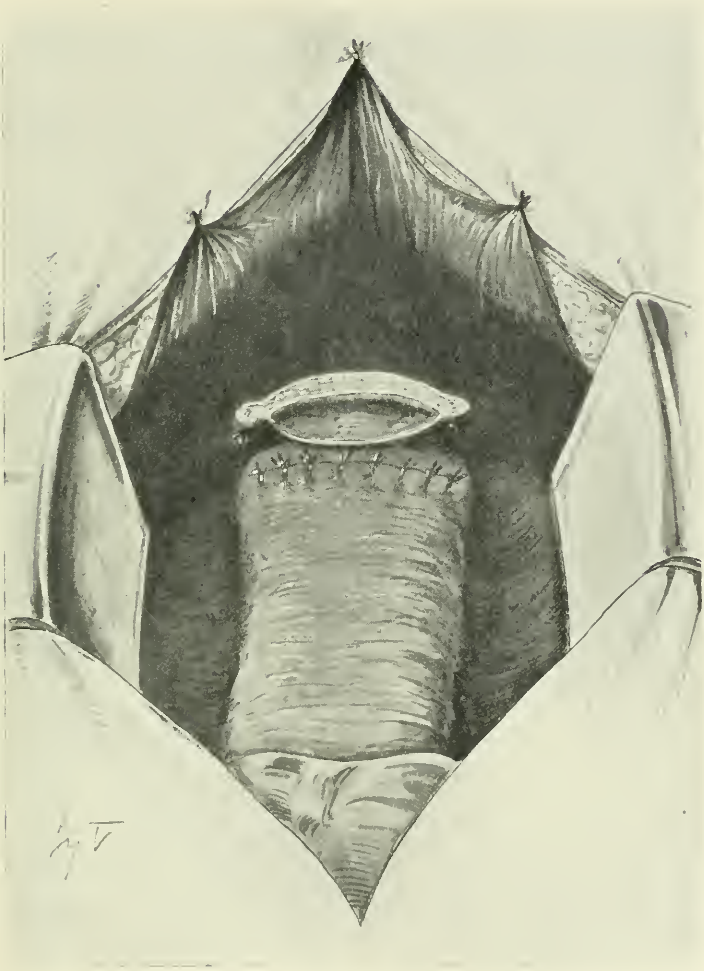

Fig. 5.

The rectal opening has been closed by a series of sutures set at right angles to the line of the gut. The uterus has been amputated and ligatures have been placed at the sides of the vagina.

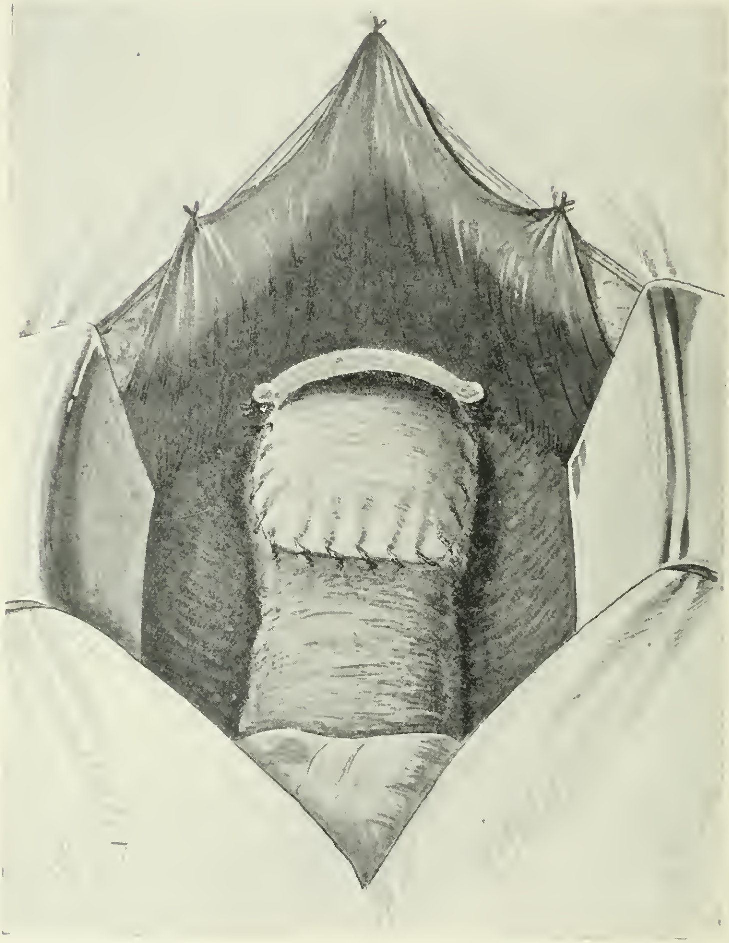

FIG. 6.

A flap has been prepared from the posterior vaginal wall and stitched to the rectum so as to cover the site of the fistula.

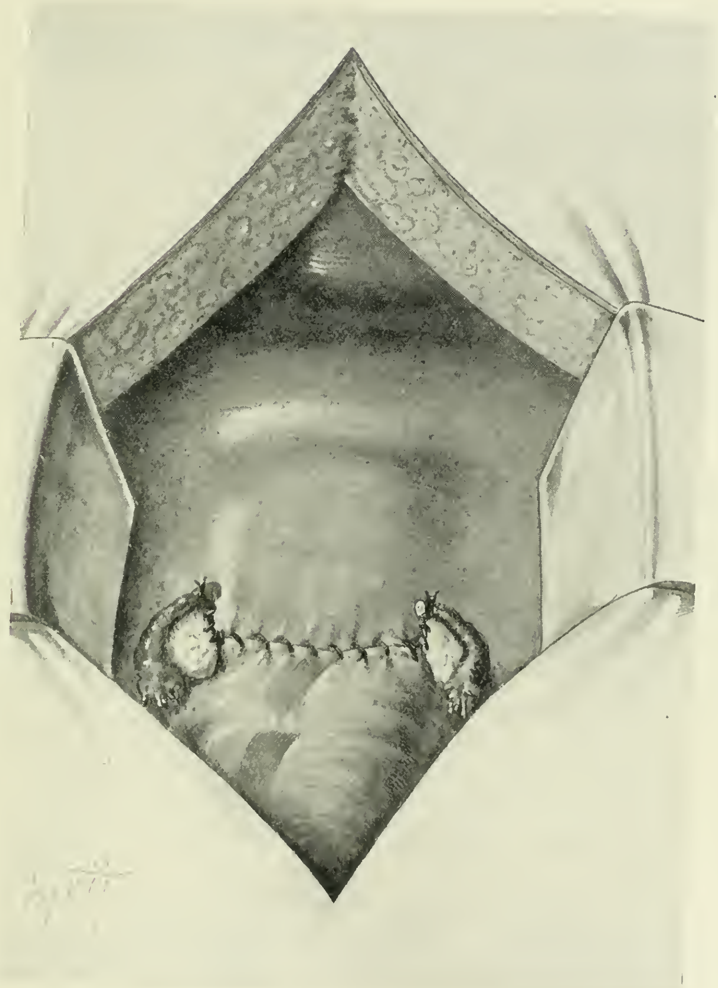

FIG. 7.

Peritonization of the pelvic floor has been completed by stitching the anterior peritoneal flap to the rectum.

a small gap felt by the finger as a depression. I was now very glad that a preliminary colostomy had been done, for, if this precaution had not been taken, I feel satisfied that the whole of the rectal wound would have broken down and the operation have proved a failure. As we could keep the parts clear of fresh fæcal infection, and there was free vaginal drainage, I felt hopeful, and, as a matter of fact, from this point onwards the patient did well. The temperature rapidly fell to normal. On the nineteenth day the vaginal discharge had completely ceased, the only treatment adopted having been a vaginal douche twice a day.

On the eighteenth day we commenced to irrigate the lower segment of the bowel through the colostomy opening. None of the fluid escaped through the vagina, and this irrigation having been repeated on several successive days, it became clear that the rectal wound had satisfactorily closed. Examination with the speculum showed a clean granulating area in the vaginal roof from which there was very little discharge.

On September 25, four weeks after the closure of the fistula, I restored the continuity of the pelvic colon. It was found necessary to excise about 2½ in. of the gut, and the ends were then re-united by end-to-end anastomosis. On exploring the pelvis during this operation a little coloured fluid was found, but there were very few adhesions to be felt. The abdominal wound was again closed without drainage. A little pyrexia followed this operation for the first ten days, and at times she complained of rather severe colicky pains. On the seventh day an aperient was successfully administered, and after this she improved steadily. There was a little serous oozing from the central part of the incision, but no suppuration occurred, and she left the hospital for the Convalescent Home on the twenty-sixth day after the third operation.

I saw her again on November 29, three months after the closure of the fistula, after her return from the convalescent home, and her condition was then quite satisfactory. She had no abdominal pain, and there was no vaginal discharge, and on examination the vaginal roof was found to have completely healed.

REMARKS.

In considering recto-vaginal fistulæ it is convenient to divide them into three groups according to their situation: (*a*) Recto-vulval fistulæ; (*b*) inferior recto-vaginal fistulæ involving the lower half of the vagina; (*c*) superior recto-vaginal fistulæ involving the upper half of the vagina.

With regard to *causation*, it may be stated briefly that recto-vaginal fistulæ may be due: (1) To direct injury to the rectum during a vaginal operation, and it appears that in vaginal cœliotomy for acute suppurative conditions the risk of injury to the rectum is most to be feared—at any rate most of the recorded post-operative cases have followed this procedure; (2) to direct laceration of the recto-vaginal septum in labour; (3) to rupture of a pelvic abscess into both rectum and vagina; (4) to ulceration from syphilitic or tuberculous disease of the rectum, or from a neglected pessary or other foreign body in the vagina.

The group of superior recto-vaginal fistulæ, to which the present case belongs, is at once the least common and the most difficult to deal with by operative means. All recto-vaginal fistulæ, except those of small size, belonging to the recto-vulval group, show little tendency to spontaneous closure. In the case of the third group this tendency may be said to be completely absent.

I have had a search made through the *Index Medicus* for the last ten years, and I find that the recent literature of the subject is scanty, and not all of the cases recorded are given in sufficient detail to be of real value. None of them are comparable to the present case, which was considerably complicated by the obstetric injury, resulting in the loss of the posterior wall of the cervix, which had occurred at the last confinement but one.

METHODS OF OPERATION.

There are three alternative routes by which a recto-vaginal fistula may be attacked:—

(1) *The Direct Vaginal or Rectal Route.*—The fistula may be attacked directly either through the vagina or the rectum and the defect sutured after preparation by freshening the edges or by flap-splitting. Posterior colporrhaphy may be combined with it. The vaginal route is the most convenient, but in cases complicated by vaginal stenosis the operation may be done through the rectum. This method is only suitable for fistulæ of small size which can be easily reached.

(2) *The Perineal Route.*—Access to the fistula may be obtained by splitting the perineum and stripping the anterior rectal wall from the vagina up to a point above the level of the fistula. In its simplest form this operation is merely an extensive posterior colporrhaphy. After

freeing the rectum to a point at least 1 in. above the fistula, the rectal and vaginal apertures are separately stitched up and the operation completed by a perineorrhaphy, which interposes fresh tissue between the now widely separated defects in the vaginal and rectal walls. In the case of fistulæ situated low down in the vagina, it is best to split the recto-vaginal septum in the middle line up to the fistula, and then deal with it as a case of perineal laceration of the third degree.

Much more extensive operations than this have, however, been performed by the perineal route, and even in the case of fistulæ situated as high as the middle third of the vagina, free access can be obtained through a transverse crescentic incision made midway between the vulva and the anus. The anterior and lateral aspects of the rectum can be freed to almost any required height, without opening the peritoneal sac, by displacing the peritoneum upwards. A point of great practical importance is to carry the dissection well above the level of the fistula so that the edges can be brought together without tension. In order to give more room, Legueu[1] splits the detached vaginal wall in the middle line up to the fistula, thus gaining additional room for working at the deeper levels; the continuity of the vaginal wall can afterwards be restored by stitches which include the fistulous defect. An important modification of the perineal operation was introduced by Segond,[2] of Paris, in 1895, and at the same time similar operations were independently performed by von Noorden,[3] of Munich, and Dudley,[4] of New York.

Segond's case presented several interesting features. His patient was a married woman, aged 31. When aged 15, she and an elder girl had each introduced an ointment-pot into the vagina; nothing was said to their friends about the matter, and they hoped it would in time be discharged. The elder girl soon became very ill and died of peritonitis; the younger suffered great pain for a time, but, four years later, she married. For ten years after marriage she remained well, but then became ill, and for a long time resolutely refused to allow her medical attendant to make an internal examination. Ultimately she got so much worse that the examination was made and the foreign body then discovered. It lay embedded in the posterior vaginal wall and was removed with difficulty, as a mass of granulation tissue had grown into the pot, filling up the cavity. When removed the whole of the posterior fornix was found to open directly into the rectum.

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[1] *Bull. et mém. de la Soc. de Chir. de Par.*, 1903, xxix, p. 793.

[2] *Ann. de Gyn.*, Par., 1895, xliv, pp. 1-14.

[3] *Aerztl. Rundschau*, München, 1895, v, p. 561.

[4] *Journ. Amer. Med. Assoc.*, Chicago, 1902, xxxix, pp. 185-90.

Segond's operation consisted in excising the lower part of the rectum, including the fistula, and stitching the cut edges of the upper segment to the skin of the anal margin. The steps of the operation were similar to that performed for rectal cancer, the sphincter muscle being conserved. He found it was not necessary to remove more than half as much from the posterior as from the anterior rectal wall and consequently amputated the rectum by a very oblique incision. The aperture in the posterior vaginal wall was simply closed with catgut sutures. The result was perfectly satisfactory.

In both von Noorden's and Dudley's cases the fistula was in the lower half of the vagina. von Noorden's patient recovered with partial anal incontinence.

Dudley, after operating in much the same manner as Segond, made the interesting suggestion that it was not necessary to amputate the entire lower segment of the rectum. If the gut was dissected free from the anus upwards the fistula could be pulled down within reach, and could be accurately stitched. Then after removing a short length of gut, the fistulous area could be fixed at a level at which it would no longer correspond with the vaginal aperture, which could be separately closed. This would simplify the procedure and sacrifice a less amount of bowel. The following year Dudley operated upon another case in this manner with a successful result.

More recently von Herff and others have further modified the perineal operation. Von Herff[1] freed the rectum in front and at the sides, but not posteriorly, for two-thirds of its circumference until the level of the fistula had been passed; he then found that the upper margin of the fistula could easily be pulled down to the anus and fixed there with stitches; the continuity of the gut being completed by stitching the limbs of the Y-shaped defect which resulted from pulling down the anterior rectal wall. It will be seen that in this method only a small part of the anterior wall of the gut is sacrificed. Von Herff's patient died of broncho-pneumonia on the fifth day.

Nearly all writers on the subject have deprecated opening the peritoneal cavity in dealing with recto-vaginal fistulæ. Freund,[2] however, in 1896 published the following interesting operation: He opened the posterior fornix and retroverted the uterine body completely into the vagina. He then stitched the uterus to the freshened edges of the large fistula in the posterior vaginal wall. Finally he made a permanent opening into the fundus of the uterus so as to allow menstrual fluid to escape into the vagina. The uterus gradually atrophied and assumed the characters of vaginal mucous membrane. Freund advised that this operation should be restricted to elderly women who have passed the climacteric, and even then, if any other operation is practicable, it should be done in preference.

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[1] *Zentralbl. f. Gyn.*, Leipz., 1907, xxxi, p. 429.

[2] *Zentralbl. f. Gyn.*, 1896, xx, p. 1009.

(3) *The Abdominal Route.*—The third method by which these fistulæ may be dealt with is by the transperitoneal abdominal operation.

I can only find mention of one case in which an abdominal operation has previously been undertaken for a recto-vaginal fistula; this was not recorded in full, but was mentioned in the discussion on the case of Legueu at the Société de Chirurgie de Paris in 1903.[1] This patient was operated on by Routier, who described the condition as "a large fistula in the posterior fornix which had existed for three years, and had resulted from a vaginal hysterectomy for acute pyosalpinx performed by an *interne*." The operation was described in a few words as "union with two layers of silk suture, closure of the abdomen without drainage, and recovery of the patient."

I cannot find any case recorded in which a preliminary colostomy has been performed: it is, however, difficult to make an exhaustive search through literature, and such cases may have been overlooked.

The two points which chiefly influenced me in selecting the abdominal operation were (1) the unusually high level of the fistula, and (2) the complete immobilization of the cervix which formed part of its upper border. These conditions necessarily rendered operative procedure from below as difficult as it could possibly be. Perhaps I ought to add a third reason—viz., that I was familiar with the difficulties of working at the level of the pouch of Douglas from above, but I had had very little experience of the extensive perineal operations which have just been described. In all operations for intestinal fistulæ success depends upon the technique of each step of the operation being perfect, and I was satisfied that I could reach the fistula more readily, and deal with it more accurately from above than from below.

One had also to consider the question of the risks associated with the two methods. Most writers on the subject have shown great apprehension of septic complications if these fistulæ were dealt with by a transperitoneal operation. These fears I did not think were justified in view of the favourable results of intestinal surgery under modern technique. It is comparatively easy to isolate the pelvic cavity from the upper abdomen during the operation, and to drain it efficiently afterwards, and I did not consider that the risks of an abdominal operation were at all prohibitive.

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[1] *Bull. et mém. Soc. de Chir. de Par.*, 1903, xxix, p. 797.

There remains the question of the preliminary colostomy. This I consider to be of the greatest importance in difficult cases, although I am not prepared to say that it should in all cases form part of the abdominal method. On considering my own case, however, I feel satisfied that without it the operation I performed would not have been successful.

There are certain clear advantages to be gained by colostomy in these operations. In the first place, it allows the operation area to be prepared by irrigation, &c., and the septic condition of the tissues thus reduced. Sterilization of the area is, of course, impossible, but in order to secure a good result two post-operative conditions are required—viz. (1) the bowel must be kept at rest with the stitches free from tension, and (2) the healing wound must be preserved from reinfection as far as possible. Isolation of the affected portion of the bowel goes a long way towards securing these requisites. An isolated piece of gut is in a condition eminently favourable for healing. It is probably not disturbed by any peristaltic movements, and is in a state of physiological rest. Not only does it become collapsed from loss of its contents, but it undergoes rapid shrinkage, until its lumen becomes smaller, and its walls thinner than an active portion of the same gut; in fact, it undergoes partial atrophy from disuse. That the absence of flatus and fæces must greatly favour healing of the wound is of course self-evident.

There are, however, certain disadvantages which must be duly considered. The whole procedure involves three operations; but it must be borne in mind that a considerable proportion of cases dealt with by other methods are not successful at the first attempt, and a second or even a third operation is comparatively often required. The first operation, that of opening the colon, is simple and practically devoid of risk. It is, however, important to bear in mind that a true colostomy must be performed which provides an efficient spur, for little advantage will be gained if a certain amount of fæcal matter passes on into the lower segment. It is, therefore, not enough merely to open the colon; it must be fixed well up out of the wound so that a good spur may be formed. The third stage, that of restoring the continuity of the bowel, is a comparatively severe operation, and if the colostomy has been done as described it will usually involve the sacrifice of a portion of the gut and restoration of its continuity by anastomosis.

I should now like to frame the conclusions at which I have arrived with regard to the choice of operation in recto-vaginal fistulæ:—

(1) For those belonging to the group of recto-vulval fistulæ, the method of direct suture is usually sufficient; posterior colporrhaphy may be done at the same time.

(2) For inferior recto-vaginal fistulæ a perineal operation is the most useful, and may be supplemented by complete or partial excision of the lower segment of the bowel, if necessary.

(3) For superior recto-vaginal fistulæ the abdominal route is probably the easiest and the best, and should prove not to be attended by disproportionate risks. In difficult cases—i.e., when the fistula is large and the parts are immobilized—a preliminary colostomy should be performed.

Dr. ARTHUR GILES said that he thought that Dr. Eden was to be complimented very sincerely on the careful and thorough way in which he had planned out his operation and for the success with which he had carried it through. Discussion on such a paper must necessarily be limited by the rarity of the condition and the consequent lack of experience of such cases among members of the Section. The nearest approach to the condition he had himself met with was that in one case he had to operate upon a vesico-vaginal fistula by the abdominal route, and he thought that in cases of fistulæ situated very high in the vagina, whether rectal or vesical, the abdominal method of dealing with them was sound treatment.

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Obstetrical and Gynæcological Section.

April 2, 1914.

Dr. W. S. A. GRIFFITH, President of the Section, in the Chair.

Peritonitis in Fœtus.

By ALBAN DORAN, F.R.C.S.

THESE three specimens were originally dissected for a demonstration by Professor Keith, Conservator to the Museum of the Royal College of Surgeons, which has not been published. Dr. Keith has kindly allowed me to make use of them, as they are of interest in relation to ante-natal pathology. They all show the intestines freely exposed, but it is alone to the ileo-cæcal region that the attention of the meeting is directed.

(1) A fœtus with no evidence of inflammatory changes in the peritoneum. The cæcum is freely movable.

(2) A fœtus with adhesions in the neighbourhood of the cæcum, which is quite fixed. This condition may represent simply a cæcum entirely behind the peritoneum, yet peritonitis may play a share in developing abnormal relations of the hollow viscera to the peritoneum.

(3) A fœtus with the under layer of the mesentery of the ileum for a wide space, ending at the ileo-cæcal valve, firmly bound down to the structures behind it. This adhesion seems undoubtedly due to peritonitis, and anatomically the mesentery is normal.

In his "Lecture on Ante-natal Hygiene," Dr. Amand Routh classified pathological fœtal conditions under the heads of hydatiform disease of the chorion, blood moles and fleshy moles, hydramnion, and lastly fœtal toxæmias. The toxæmias, most probably, arise as a result of altered metabolism in the fœtal placenta, especially in the cells of the syncytium or of Langhans's layer, and perhaps even in the fœtus itself. I cannot find any evidence that these changes are ever of mechanical origin, such as perforation of intestine; and, on the other hand, it is quite likely that they represent toxæmia. Dr. Keith and Mr. Wilson, our prosector, find that these results of peritonitis are by no means uncommon.[1] Should the fœtus survive, obstruction, strangulation, &c., may develop long after birth. We are concerned, however, with the primary fact that peritonitis develops before birth. There is need for yet more research. Where peritonitis is detected the fœtus should be handed over, as suggested by Dr. Routh, to an experienced bacteriologist. He might settle the questions: Is there a toxæmia after all? If there be one, to what particular type does it belong? What is its source? If there be no toxæmia, what causes the peritonitis?

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[1] For the relation of fœtal peritonitis to monstrosities and malformations pertinent to the present question, Ballantyne's standard "Ante-natal Pathology and Hygiene" must be consulted.

Discussion on the Need for Research in Ante-natal Pathology.

Opened by Amand Routh, M.D.

Early in my professional career I was greatly impressed by being asked to review Sir William Priestley's [17] lectures at the Royal College of Physicians in 1887 on "Intra-uterine Death." (The Lectures are most fascinating, if only to show how difficult it then was to arrive at a correct opinion on the subject in the absence of the scientific methods we now possess.) Sir W. Priestley's words would apply in a great measure to our present knowledge of ante-natal pathology. He said, "We are as yet only on the threshold of those investigations which must reveal to us eventually the best methods of obviating death in unborn children. In the meantime, so far as the prevention of some of the forms of intra-uterine death is concerned, we are absolutely in the dark, and the therapeutics of the subject are still as a closed book." Except perhaps as regards ante-natal syphilis, are we much further advanced in knowledge, after an interval of twenty-seven years?

Stimulated, I expect, by Sir W. Priestley's lectures, Dr. Herbert Spencer [20] in the same year, 1887, began an exhaustive examination of 130 consecutive stillbirths (and his paper of 100 pages is one of the most valuable in our annals). What a triumph for him and for our British obstetricians, if he, instead of Schaudinn, had discovered the *Spirochæta pallida;* but unfortunately Dr. Spencer had not then at his disposal our modern methods of research.

Both gynæcology and obstetrics are entering upon new therapeutic phases and allied sciences are being more and more utilized. Thus the surgical treatment of fibromyomata and cancer of the uterus and vagina is being invaded more or less successfully by treatment with Röntgen rays and radium emanations, and "medical gynæcology" requires to be dealt with in a book of 700 pages by such a surgical expert as Howard Kelly.

We are less and less disposed to treat disease now unless we know something of its causation and pathology, for we realize that prophylaxis and treatment alike are most successful when the life-history of the disease is known. For some few years obstetricians have felt that there are many branches of their speciality which are being treated empirically without this sure knowledge. Amongst these the toxæmias of pregnancy [18], which have a large share in ante-natal disease and death, are prominent.

Good work regarding the toxæmias has lately been done, and this Section has had valuable communications from its members. I may mention Dr. W. C. Swayne's [21] paper on "Acidosis in Pregnancy," that of Dr. Williamson and Dr. Barris [29] on "Pyelonephritis of Pregnancy," and the discussion here on Dr. Paramore's [16] paper on "Intra-abdominal Pressure in Pregnancy as a Possible Cause of the Toxæmias." The researches, too, of Dr. Louise McIlroy [15] and of Dr. Blair Bell [4] upon the harmonious functions of the ovaries and the other ductless glands show us clearly that the question of auto-toxæmia has to be considered from a much wider aspect than we at first suspected. From the point of view of the fœtus, papers on "Blood Pigment in the Fæces of the New-born," by Dr. Hector Colwell and Mr. Glendining [7]; on "Congenital Graves's Disease," [24] and "Generalized Œdema of the Fœtus," [25] by Dr. Clifford White, are both interesting and important. "Bacterial Infection of the Chorion in a case of Hydrorrhœa Gravidarum," by Dr. Napier Burnet, [6] opens up a new method of investigation of a little understood condition.

ANTE-NATAL DISEASE AND DEATH.

Obstetricians have recently been considering whether more cannot be done to lessen the enormous loss of life which goes on during gestation. If I am right in my estimate [19] that there are about four times as many abortions as stillbirths—i.e., 2·2 stillbirths and 8·8 abortions to 100 live births—it means that in England and Wales about 100,000 fertilized ova die annually before they are born, and it follows that about as many infants die in their nine months of intra-uterine life as during the survivors' first year of life. These estimates are much below those given by Priestley, who said "there is one abortion to every three or four full-term deliveries, and that from three to six out of every ten women abort at least once during their married life." Can this Section suggest how statistics regarding abortion can be obtained from a large series of average married women, so that the relation of abortions to live births can be definitely known. Even then, there would be numerous unrecorded, because unrecognized, very early abortions.

We know very little of the causes of this terrible mortality. The following table includes most of them :—

CAUSES OF ANTE-NATAL DISEASE AND DEATH.

(I) Paternal Causes.

Syphilis and *tuberculosis*, by direct infection of ovum.

Diabetes, Bright's disease, plumbism, &c., inducing debility of embryo.

(II) Maternal Causes.

(A) Pathological.

(1) *Malnutrition.*—Anæmia, &c.

(2) *Acute specific and infectious diseases*, &c. — Small-pox, scarlatina, measles, enteric, influenza, erysipelas, pyelitis, acute pneumonia, bronchitis, &c., gonorrhœa.

(3) *Chronic diseases.*—Tuberculosis, syphilis, diabetes, Bright's disease, heart disease, asthma, plumbism, chorea, alcoholism.

(4) *Tropical diseases.*—Malaria, cholera, dysentery, &c.

(5) *Toxæmia.*—Pernicious vomiting, albuminuria, eclampsia, acute yellow atrophy of liver (? chorea, ? diabetes).

(B) Mechanical.

Retroversion of gravid uterus, pelvic contractions, obstructing tumours (fibromyomata, ovarian, osteomata), carcinoma cervicis, cicatricial stenosis of cervix, vagina, &c., ventrifixation of the uterus, vulvar abnormalities.

(C) Miscellaneous.

Pelvic inflammations, *ante-partum* hæmorrhages (accidental, placenta prævia), ectopic gestation, criminal abortions, operations during pregnancy.

(III) Fœtal Causes.

(A) Developmental.

(B) Pathological.

Hydramnios; hydatidiform degeneration of chorion, blood moles; fœtal toxæmias.

(C) Mechanical.

Malpositions and malpresentations, malformations, relatively large children.

Note.—Many of the above conditions could be diagnosed early and appropriate treatment adopted, if women were under medical supervision during pregnancy.

If my colleagues have been as lax as I have been in my past efforts to ascertain the causes of abortions or stillbirths, they will realize how many opportunities have been missed in not having the expelled products of conception systematically and scientifically examined with a view to discover the cause of death. Theoretically at all events, with the methods now at our disposal, we ought to be able to determine the cause of an intra-uterine death as correctly as of an extra-uterine death. Probably we are all agreed that a few of the abortions and premature births are due to primary uterine contractions, the fœtus being normal. Maternal and perhaps paternal malnutrition may be a large ætiological factor both as regards early abortions and births of sickly children. I understand that Mr. Darwall Smith has been investigating the subject of malnutrition and will give us his conclusions. All the other spontaneous premature deliveries are due *ultimately* to some pathological condition of the fœtus and its membranes, or of the maternal or fœtal placenta.

Difference between Embryonic and Fœtal Pathology.

Ante-natal disease and death must be considered in its early embryonic stages as well as in its later or fœtal stages. Ballantyne [2] points out the great differences between the results of pathological activity in the embryo and in the fœtus, and he shows that whilst in the fœtus diseases are more or less of the same nature as the maladies of post-natal life, "in the embryo the morbid conditions are extraordinarily dissimilar from anything else in the whole field of pathology." He shows that this remarkable difference in the pathology of the embryo and of the fœtus depends largely upon the initial and equally important difference between the physiology of the embryo and of the fœtus. In the embryo the main function is organo-genesis, the formation of tissues and organs, whilst in the fœtus the functions of these organs are gradually developed, and these functions, with certain variations, are continued and perfected in the post-natal period of life.

Maternal diseases affecting the embryo during the period of organogenesis cause teratological results, tending mainly to structural anomalies or monstrosities, whilst the same diseases affecting the functionally active fœtus would be pathological, causing disordered function and disease on lines approaching more and more to functional diseases in post-natal life. In both stages the life of the embryo or fœtus may be lost. In the study of ante-natal pathology we have to find out how paternal and maternal disease, such as syphilis or tubercle, affects the fertilized ovum in its embryonic and in its fœtal stages, and it is evident therefore that whilst ante-natal pathology should be studied as an important unit, with its own characteristic processes, yet it can only be successfully dealt with by pathologists who are familiar with post-natal pathology in all its variations.

I propose to allude to a few of the problems which face us as regards ante-natal disease and death due to the toxæmias of pregnancy, and to some of the more general maternal diseases named in my list of causes, and then to discuss rather more fully the special difficulties as regards syphilis and tuberculosis. Both these diseases cause serious disease and death in post-natal life, yet they differ in an extraordinary degree in the way they affect the embryo and the fœtus.

We know very little concerning the intra-uterine mortality due to the toxæmias of pregnancy, especially in those obscure cases where autotoxæmia is merely causing renal inadequacy with little or no albuminuria, but with a greatly reduced output of urea. These unrecognized cases are not infrequent causes of fœtal death in the last weeks of pregnancy. Research, again, will prove whether in cases of maternal albuminuria, eclampsia, or acute yellow atrophy of the liver, the fœtal organs participate in the pathological changes found in the mother in these diseases. In such serious and often fatal toxic diseases, our every effort is concentrated on the mother, and the pathology of the fœtus, also often dead, is disregarded. Careful examination of the organs and tissues of a fœtus expelled during the severe types of *chorea gravidarum* may help us to determine the causation of that complication, as to whether, for instance, it is toxæmic in origin.

As regards some of the more general causes of ante-natal disease and death, I would ask a few questions :—

Why do cases of small-pox and measles so often cause abortion?

Why is scarlatina relatively so rare in pregnancy?

Enteric fever is said to cause abortion in about 50 per cent. of women attacked during pregnancy, and it is stated that the typhoid bacillus is often found in the fœtus. Is the fœtal death in these cases due to fœtal infection or to toxæmia?

What is the ætiology of pyelonephrosis gravidarum? Does it affect the fœtus *in utero* or is it solely maternal and local?

Women who abort during acute pneumonia almost invariably die. Is the fœtus expelled by uterine contractions caused by the ecbolic action of the deficiently oxygenated blood, or does the fœtus die for want of oxygen, or from hyperpyrexia, or from toxæmia, or from infection by the pneumococcus, which has been found in a few cases?

Is the severe diabetes of pregnancy, as described by Matthews Duncan [8], Whitridge Williams [27], and others, due to an autotoxæmia, affecting especially the pancreas or one of the ductless glands?

What are the sources of maternal autotoxæmia? It is probably mainly placental in origin, but our knowledge of the functions of the placenta is still very imperfect. We know that ferments are produced by the trophoblastic layers of the chorionic epithelium, and that these exert a destructive action upon the surrounding maternal tissues, with a result that toxins and compensatory maternal antitoxins are formed. Whether the autotoxæmias are the result of excess of toxins or of antitoxins is still uncertain. Abderhalden [1] has demonstrated these ferments after the sixth week of gestation, and Dr. Herbert Williamson [28] considers that their presence provides us with a reliable serum diagnosis of pregnancy. This reaction is not, however, reliable in pregnant women who are syphilitic, for it may be then negative.

SYPHILIS.

Bacteriology has led to the discovery of the specific germs of so many of the maternal diseases which cause fœtal death that our task now is much easier, and this is especially true as regards syphilis since the discovery of the *Spirochæta pallida* by Schaudinn in 1905, of the diagnosis of syphilis by Wassermann's reaction in May, 1906, and of its treatment by salvarsan by Ehrlich in 1909. Then there is still the more recent (1912) discovery by McDonagh, not yet generally adopted, of spores which are the result of the multiple division of the fertilized female cells which, after entering a connective tissue cell, develop there into both sexual and asexual organisms. In McDonagh's [14] view the cause of syphilis is the spores, whilst the *Spirochæta pallida* which is developed ultimately from the male gametocyte of the sexual organism is responsible for the symptoms. These views, if proved to be correct, will help to explain many of the difficulties which the discovery of the *Spirochæta pallida* created, such as the possibility of paternal infection of the ovum; the explanation of Colles's law; the negative Wassermann reaction in some mothers of syphilitic children; the recurrence of syphilitic phenomena after apparent cure, the spirochæte being destroyed but the spores persisting; and the involvement of the nerve centres, where the spirochæte is not always found.

Let me first allude to some facts which are common knowledge.

Evidences of Syphilis in the Stillborn Fœtus.—Eden [9] states briefly that these are "A bullous eruption (pemphigus) on palms and soles, gummata in liver and spleen, hyperplasia of the cartilaginous element along the line of junction of the shafts of the long bones and the epiphysis." Elsewhere we are told that the *Spirochæta pallida* is found in the fœtal lungs in 87 per cent., pancreas 80 per cent., skin 66 per cent., suprarenals 64 per cent., spleen 62 per cent., liver 59 per cent., kidneys 54 per cent., but it is easiest to find it in the liver and spleen.

Placental Syphilis.—In my student days we were taught that a syphilitic placenta was small and shrivelled. Now we know that relatively to the fœtus syphilitic placentæ are large and heavy, bearing the proportion of 1 to 3, instead of the normal 5·5 according to Blacker, who also states that the syphilitic placenta is pale, soft, friable, and mottled with yellow patches, whilst the cord may be œdematous and liquor amnii excessive. The villi are enlarged, and the intervillous spaces often obliterated. Peri-arteritis and endarteritis are present, leading to degeneration of the stroma. Sometimes the syncytial cells proliferate. Blacker says the *Spirochæta pallida* can be demonstrated readily in the villi, but are rarely found in the maternal decidua. Weber [23] states, however, that in most cases where the mother has presented a true Wassermann reaction he has found spirochætæ in the maternal part of the placenta. Trinchese [22] states that spirochætes can usually be found in the centre of the villi of the placenta if present in the fœtal organs, but they also are found in the intervillous maternal spaces and in the epithelium of the villi, showing that they can pass from the maternal to the fœtal blood-stream and vice versa. If it could be shown that in those cases where an apparently healthy mother bears syphilitic children, and yet presents a negative Wassermann reaction, spirochætes are only found in the fœtal part of the placenta, it would explain partly what is at present a difficulty.

Infection of Fœtus.—Fœtal syphilis may be due to direct paternal infection of the ovum at the date of fertilization, or the early fertilized ovum may be paternally infected whilst it is in the Fallopian tube or in the uterus. More usually the fœtus is infected by the mother, either by the infection of the ovum before conception whilst in the Graafian follicle, or in its passage along a syphilitic Fallopian tube, or during its first attachment to a uterus in the mucosa of which *Spirochæta pallida* exists, but as a rule maternal infection of the fœtus is transplacental.

Some observers have thought that syphilis does not affect the uterus, but Dr. Louise McIlroy [15] and Mr. Beckwith Whitehouse [26] have made valuable researches into the question of the possibility of syphilis being one of the causes of chronic metritis and fibrosis uteri, and their papers open up the important point whether *Spirochæta pallida* may not, after all, be found in the uterine tissues, and, if so, able to infect a freshly implanted ovum. Probably the first approach to a routine examination of stillbirths, published in this country after the discovery of the *Spirochæta pallida*, was made by Herbert Williamson and Eardley Holland [30], who read a valuable paper in April, 1908, at this Section, on "A Case of Intra-uterine Death of the Fœtus occurring in Six Consecutive Pregnancies (with Observations upon the Importance of the Examination of the Fœtal Tissues for the Presence of the *Spirochæta pallida*." In this case neither husband nor wife afforded any history or clinical evidence of syphilitic infection, and specific treatment was not adopted till her sixth confinement, in September, 1906, when search was made for the *Spirochæta pallida* in the macerated fœtus by Dr. Eardley Holland, then Resident Medical Officer at Queen Charlotte's Hospital. He found the organism freely distributed in the connective tissue of the liver and spleen, but not in the umbilical cord. The placenta had been destroyed. In May, 1907, the woman was again pregnant, and was put under treatment by mercury and iodide of potassium. She was delivered of living twins on November 1 after induction of labour. Unfortunately, these were born too prematurely, owing to a miscalculation of the date, and both children died; but no evidence of syphilis was found in either. (The Wassermann reaction was not then available, or Dr. Williamson might have discovered that the mother or father, or both, were infected.) Dr. Eardley Holland, as is only fitting as a potential successor to Sir W. Priestley at King's College, is now again examining a series of macerated stillbirths. He tells me that he found the *Spirochæta pallida* in six out of the first seven and in twelve out of the next eighteen macerated fœtuses examined by him. As he and Dr. Ridge are making investigations not only of the fœtus, but of every placenta, and into the question of the paternal and maternal infection in every case, we shall look forward later on to a valuable monograph on the subject from him as well as from other members of our Section. Dr. Mott will be able to tell us to-night of his examination of macerated infants on an even larger scale.

The Effect of Syphilis in causing Abortions.—Much difference of opinion on the subject exists. Blacker [5] expresses the view held by most observers, that "syphilis is the commonest cause of repeated abortions and miscarriages," but we only have clinical evidence of this, and some recent pathologists disagree, because the spirochæte is not often found in early abortions. Thus Eardley Holland quotes Frantz Weber [23], who has investigated a series of 300 abortions where no clinical evidence of maternal syphilis was forthcoming. Weber does not believe that abortions are often due to syphilis. He tried the Wassermann reaction in sixty-seven of these cases, and in thirty-five of these, where abortion had occurred before the sixteenth week of pregnancy, reaction was uniformly negative, and no spirochætes were found in the embryo; in thirty-two cases, between the sixteenth and twenty-eighth week, twelve gave a positive reaction, and in nine of these spirochætes were found in the embryo. On the other hand, Weber found spirochætæ in the organs of 84 per cent. of macerated fœtuses born in the later months of pregnancy. Fournier, in 1878, pointed out that the co-existence of anomalies of structure, and more especially of malformations and a syphilitic parentage cannot be regarded as accidental. Amongst such malformations he mentioned hare-lip, extroversion of the bladder, spina bifida, and imperforate anus, and he considers that some of the dystrophies of the embryo, such as infantilism, cranio-facial malformation, and dental anomalies are peculiar to syphilis, but the whole subject wants working at with the new aids to diagnosis of parental syphilis. Ballantyne [2] considers, in addition to syphilis, tubercle and alcohol, and perhaps sepsis and the enteric poison, may occasionally produce dystrophic effects. Maternal malnutrition or overwork may be other causes of fœtal dystrophies. The Registrar-General draws attention to the exceptionally high fœtal mortality arising from "developmental defects" in women who work at industrial trades in their later months of pregnancy. Such organic results of infection of the early embryo, especially if associated with structural anomalies of the fœtal membranes, would often produce early abortions, in which, apart from dystrophic changes in the embryo, there might be no other evidence of disease. Some of these early abortions are, perhaps, the result of paternal infection of the ovum. Cases have been referred to by Howard Kelly [12] and Ballantyne [3], where the apparently healthy wife of a syphilitic father has had frequent abortions, but after antisyphilitic treatment of the father alone the subsequent pregnancies have gone on to the full term. Leroux [13] believes firmly in paternal syphilis, but thinks it should be divided into two classes: (1) Patent paternal syphilis with latent maternal conceptional syphilis; (2) patent paternal syphilis without maternal syphilis. He says paternal syphilis gives rise to more abortions; maternal syphilis, or mixed transmission, gives rise to more macerated infants. Clinical evidence in favour of abortions being caused by syphilis is very strong, abortion often alternating with stillbirths or macerated fœtuses, and treatment of the mother with mercury is known to result in the birth of healthy children. Why spirochætes are not often found in such abortions requires explanation. Maternal syphilis, whether derived direct from the father or *via* the infected ovum, is, of course, more important to the nation, as the mother is the child-bearer. Hochsinger [11] has been able since 1869 to keep under observation 134 women who showed no signs of syphilis, but had given birth to syphilitic children on 569 occasions. Of these 253 children were born dead—i.e., 44·4 per cent.—and 316 were born alive. Of those born alive, 263 were syphilitic, and only 53 were healthy. Of the 263 syphilitics, 55 died before the fourth year. These are appalling figures.

Colles's Law.—The vexed question of the significance, the interpretation, and even the truth of Colles's law must be settled, for treatment depends upon it. All Colles originally stated was that a woman who gives birth to a syphilitic child does not get infected by that child, whilst the child can infect another woman—e.g., chancre on nipple. It is still uncertain whether this fact means that the mother is herself infected, and so cannot be reinfected, or whether the ovum is paternally infected, and the mother is rendered immune by the nine months' interchange of fœtal antibodies during pregnancy. The further fact that the Wassermann reaction is often negative in these mothers during the pregnancy, but may become positive a month or so afterwards, requires careful consideration. The negative Wassermann reaction is not due to the altered blood state in pregnancy, for if a woman is herself infected before or after conception the Wassermann reaction is positive during the pregnancy, whether the clinical evidences are well marked or very slight. There are at least four theories which may explain the fact that mothers of syphilitic children do not get infected by their children, and yet are themselves apparently free from the disease. The first two theories presuppose paternal infection of the ovum:—

(1) *Founded on McDonagh's* [14] *Discovery of "Spores."*—These spores, which are very minute, and are capable of being conveyed in a spermatozoon, are to a great extent indestructible by syncytial ferments or by salvarsan. The spores pass up with the semen along the Fallopian tubes and find themselves in both the fœtal and maternal portions of the early embryo—i.e., in the villi and the intervillous spaces. The spores in the villi of the chorion or among the embryonic cells develop into the spirochæte, and may or may not destroy the embryo. If it survive, it becomes a congenital syphilitic, with a positive Wassermann reaction at or soon after birth. The spores in the decidua and the *maternal* portion of the early placenta do not develop into spirochætes during the pregnancy, owing to the presence of syncytial ferments and their resulting toxins, which circulate in the maternal blood, but not in the fœtal. The "spores" are not destroyed, because their chemical structure, unlike that of the spirochæte, is not seriously affected by the toxins present. This delay in development in the maternal tissues during pregnancy may explain the negative maternal Wassermann reaction during that period. The development of *Spirochæta pallida* goes on shortly after labour in the maternal tissues, and the mother then presents a positive reaction. This is one variety of conceptional syphilis.

(2) *The Mother rendered Immune.*—The ovum is fertilized and infected at the same time. The mother is rendered immune by antibodies formed in the fœtus, and by cells of the fœtal syncytium thrown off into the maternal circulation during pregnancy.

(3) *Latent Syphilis.*—The mother has been previously infected, but the disease is latent.

(4) *A Symptomatic Syphilis.*—The mother is infected, but clinical evidences are insignificant or absent.

ANTE-NATAL TUBERCULOSIS.

According to most British authorities ante-natal tuberculosis is almost non-existent, that is to say, they do not believe that a tubercular father's spermatozoon ever directly infects the ovum at the time of fertilization (Dr. Camac Wilkinson in a private letter refers to Gärtner's elaborate experiments upon animals as strongly supporting this view), and they further state that the mother practically never infects the fertilized ovum, because tubercle bacilli very rarely circulate in her blood.

Placental tuberculosis also is said to be very rare for the same reason, and even if present the tubercle is in the intervillous space, and does not penetrate through the syncytial cells of the villi themselves. Research is required to decide these points. On the other hand, I would urge that *paternal infection* of the ovum is surely not only possible but probable, especially in cases, for instance, where the genito-urinary organs of the male parent are infected, as in some early cases of tuberculosis of the bladder or vesiculæ seminales. Whitridge Williams states that experiments upon rabbits and guinea-pigs seem to show that the male parent can thus infect the ovum.

Maternal infection of the fertilized ovum is difficult to prove, for very few children of tuberculous parents have clinical evidence of tubercle at birth. It has, however, been demonstrated that tubercle bacilli are sometimes seen in the interior of ova which are still within the Graafian follicle.

Ballantyne [3] gives several instances of fœtal tuberculosis, where tubercle bacilli were found, but he says that such cases are rare. Cases are also reported where no tubercular lesions have been present, yet the tubercle bacilli were found, and inoculation of animals with the fœtal blood or tissues from these cases has led to the development of tubercle.

It is difficult to explain why tubercle is so rarely found in the fœtus. I have already alluded to some explanations. Tuberculosis of the maternal generative organs again would not be likely to infect the fertilized ovum, for it would probably cause sterility, so that direct infection of the ovum or attached placenta by contact with tuberculous tissue would not occur. Supposing, too, that tubercle bacilli reach the maternal parts of the placenta, it is quite possible that the syncytial ferments and the toxins locally produced would so affect the bacilli as to prevent them from penetrating into the villi themselves. Another possible explanation of the rarity of tubercular lesions being found in the fœtus may be that the infection of the early embryo, as in syphilis, may show itself by malformations and anomalies leading to early or unrecognized abortion. Whether such early abortions are often due to tubercle is a very difficult problem. It is apparently true that tubercle bacilli are not found in the early embryo, but the same is true as regards the *Spirochæta pallida* in the abortions of syphilitic parents, and yet the spirochætes abound in the stillborn fœtus a few months later. Dr. Jane Walker in a private letter says: "Tubercle bacilli do not produce abortion, in my experience." Dr. W. C. Wilkinson says much the same, and points out that tuberculous cows rarely abort, but he states that placental tuberculosis, though rare, may cause such lesions in the placenta as to lead to abortion.

V. Hanot [10] has described various dystrophies which may be due to ante-natal tuberculosis, and which had apparently taken the place of a true tubercular lesion.

There is another interesting point of resemblance in the children of tubercular and syphilitic parents, in that, according to Dr. Wilkinson and Dr. Eric Pritchard, the children of tuberculous mothers within the first few weeks of life do not react to tuberculin, but a month or so afterwards the tests may be positive. This is difficult to explain, except on the ground of acquired immunity during intra-uterine life, and reduced immunity afterwards. Whilst the fœtus was *in utero* it would be immune to tubercle, owing to its receiving anti-tuberculous toxins from the mother, which she would be developing beyond her own requirements, owing to her improved general health during her pregnancy. After birth the child loses this constant supply of antitoxin, and offers less resistance to tubercle bacilli already in its tissues or due to fresh infection, and swollen glands and other evidence of early tubercle would develop. In this connexion I would allude to experiments referred to by Ballantyne, in which tubercle bacilli have been introduced into the hen's egg, and it is found that the bacilli remain latent, setting up tuberculosis in the chick only after it is hatched out.

If the structural abnormalities of the embryo derived from syphilitic and tubercular parents were respectively noted it might be possible to discover some abnormalities which were common to both diseases, and possibly other dystrophies peculiar to, or characteristic of, each infection. It is self-evident that if syphilis or tubercle bacilli do infect an early ovum enormous damage could easily be effected to the three cellular layers of the blastoderm.

These remarks, and more especially the discussion which will follow, will tend to show how divergent views are and how little we are sure of as regards ante-natal pathology. I hope, too, that obstetrical pathologists will receive a stimulus towards research, which will not only be interesting, as all pioneer work is, but will eventuate in results which will soon be apparent in preventing disease and saving ante-natal life.

HOW TO PROVIDE FACILITIES FOR RESEARCH.

Every general hospital and lying-in hospital in our larger towns should be provided with ante-natal research laboratories. In addition, wherever practicable, laboratories should be formed in every county and county borough under the supervision of the Medical Officer of Health, where abortions and stillborn fœtuses could be collected, and either examined there or sent on in sealed jars (labelled and with history appended) to the nearest ante-natal laboratory.

As a preliminary or perhaps as a permanent alternative to this extended investigation of abortions and stillbirths, I would suggest that this investigation shall be carried out in large cities by forming centres of small groups of general hospitals, lying-in hospitals, and poor law infirmaries, with the co-operation of old students, so that material for research can thereby be ensured. Funds are, of course, the difficulty, but by concentrating effort in a few centres expense would be minimized. Such a centre must be officered by (1) an obstetric expert, who is also a pathologist; (2) a pathological expert with practical knowledge both of bacteriology and pathological histology; and (3), if possible, an expert in physiological and pathological chemistry.

The investigation must not only be pathological, but to increase its usefulness and to round off the knowledge obtained, clinical observation must be added. Thus, if spirochætes are discovered in a macerated fœtus, the case would not be complete unless the history of both parents were inquired into, and the appropriate treatment adopted in view both of the parents' health and that of subsequent children.

In conclusion, I would urge obstetricians to look upon research into ante-natal pathology as only one of the methods which must be advocated in order to deal with statistics, the supply of material for research, and for help in the diagnosis, prophylaxis and treatment of ante-natal diseases, for without such associated methods any large reduction of the ante-natal death-rate is impossible. I allude especially to:—

(1) *Compulsory registration of stillbirths*, with a medical certificate of the probable cause of death. This certificate should be secret so far as the causes of death were concerned, if desired by the doctor.

(2) *Compulsory notification of stillbirths* to the Medical Officer of Health of the district, with a secret certificate of the cause of death. This would make it easy for the parents to be treated if necessary.

(3) *Compulsory notification* to the Medical Officer of Health *of every abortion of a formed* fœtus, and of every stillbirth within thirty-six hours of birth, or within twelve hours if the mother is not attended by a medical practitioner. The Medical Officer of Health should issue instructions that all products of conception should be sent to his laboratory for examination.

(4) Arrangements by which every poor woman can have *medical supervision* during pregnancy. (Pregnant women who are themselves insured under the National Insurance Act are entitled to a "Pregnancy Sickness Benefit" if certified to be incapable of work, and also to a "Maternity Benefit" after parturition.) Such women, therefore, should be encouraged to *voluntarily notify their pregnancy* to their panel doctor or midwife. (If to the latter, the midwife should notify the Medical Officer of Health, and these voluntary notifications would enable the potential mother to be medically supervised by the panel doctor, or by the Medical Officer of Health's representatives.) Medical supervision of pregnant women would be made easy if the administration of the Maternity Benefit and the Pregnancy Sickness Benefit were transferred from the Approved Societies to the Local Health Authorities.

(5) As advocated by Dr. Ballantyne in 1891, *pre-maternity wards* in large towns, and reserved beds in cottage hospitals in rural districts, should be provided where pregnant women can receive medical treatment.

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DISCUSSION.

Dr. J. W. Ballantyne (Edinburgh), whose remarks, as he was unable to be present, were read by the Secretary, stated that it was a matter for congratulation that the Obstetrical Section of the Royal Society of Medicine had resolved to devote a sitting to the consideration of the need for research in ante-natal pathology, and that so able an opener of the discussion had been found in Dr. Amand Routh. He (Dr. Ballantyne) was honoured in being asked to take part, and he was glad if anything he could say should be a means of aiding the progress of ante-natal pathology and hygiene.

On turning over the twelve hundred pages of the "Manual of Antenatal Pathology and Hygiene," published ten years ago, he had been impressed as perhaps never before by the enormous number of unsolved problems which were to be found on almost every one of these pages. A great deal had been accomplished in the ten years, but most of it had been preparatory to the solving of the problems raised in ante-natal pathology, and had not touched the crucial questions at all. For instance, the *Spirochæta pallida* had been discovered since then; but the great mysteries of the mechanism of germinal invasion, of embryonic alteration, and of fœtal infection by syphilis, remained hardly at all illuminated. And yet, in view of the appalling ante-natal mortality due to this disease, these were not enigmas which could in any sense be regarded as of purely academic interest; they were vital matters in the history and perhaps even in the preservation of the human race.

He (Dr. Ballantyne) had been so attracted by the need for investigation of the problems of ante-natal pathology, as viewed from the side of the new life in the uterus, that for many years—from 1887, when he published his first paper on general dropsy of the fœtus, till about 1899, when he gave the lectures on Ante-natal Pathology and Teratology in the University of Edinburgh and in the Polyclinic and Medical Graduates' College of London—he devoted comparatively little attention to the other side of the matter, the pathology of pregnancy, as viewed from the standpoint of the mother. With the beginning, however, of the work in the pre-maternity ward of the Edinburgh Royal Maternity Hospital, in 1901, he had been led—driven rather—to a continuous investigation of the morbid states of gestation as they affected the mother.

There were, therefore, two large regions to be explored. There was that of the physiology and pathology of pregnancy, an immense territory, as anyone could tell who simply looked over the headings of the contributions which were being made to its exploration every month, as set forth in the pages of the *Index Medicus.* He himself had had charge of the pre-maternity ward for three months out of each year lately, and since 1909, when he published an account of the work for the earlier years, he had been on duty for fifteen months, and had passed 159 cases of pregnancy disease through the ward. In the list of 159 there were many albuminurias, eclampsias, hyperemeses, heart cases, and abortions, but there had been also rarer complications, such as grave anæmia, catarrhal jaundice, myxœdema, gastric ulcer (a fatal case), sarcoma of thigh, chorea, phlegmasia of both legs (a fatal case), epilepsy, hydatid mole, triplets, tuberculosis, pyelitis, recurrent fœtal death, hæmaturia found to be due to an ulcer in the bladder, stone in the kidney, ovarian tumour, croupous pneumonia, and bronchitis. Patients had also been taken in for retroflexion of the gravid uterus, for prolapse of the uterus both early and late in pregnancy, for varicose veins, and for several other troublesome, if not dangerous, complications of the gestational state. Any maternity hospital which made provision for pregnancy cases would not lack patients to be treated and clinical problems to be solved. A large, it might be a great, book had yet to be written by some man or group of men on the pathology and hygiene of pregnancy. Who would undertake it?

There was the other large region to be occupied by the scientific investigator, that of the physiology and pathology of each of the three periods of ante-natal life so far as the new being was concerned; the periods, he meant, of germinal, embryonic, and fœtal activity. He thought it was time for the obstetrician to embark upon the study of the earliest period, that of germinal life; it had been left too long to the student of eugenics, who came to it often with a very imperfect knowledge of midwifery and even of embryology. There were also the malformations of the embryo and the diseases of the fœtus, each a very large field for research. It was not necessary to wait for pre-maternity wards in order to investigate the above-named matters; every maternity hospital had an abundance of material to keep many investigators busy for many years.

Then, between these two regions there was that common to both, the department of the normal and abnormal working of the great structural connecting link between mother and unborn infant, the placenta and (in the early months) the decidual membranes. He believed that the most pressing problem at the present moment was the finding out of the functions of the placenta in health, and the manner in which these were modified, first by abnormal states of the mother, second by morbid conditions of the unborn child, and third by disease or malformation in itself. How did it react to microbes, toxins, poisons, and the like in the maternal and fœtal blood? Was it a safeguard or a death-trap in disease? How much of it was necessary for the growth and nourishment of a child? And so on, and so on. There were problems, too, in connexion with the amnion, chorion, and liquor amnii, but he regarded them as less immediately vital.

Then, as regarded the reasons which made such researches necessary or desirable, he was of opinion that there were at least three which were well worth naming. There was first the scientific interest of the researches themselves, and the possible light which they might well be expected to throw upon the problems of life, health, and disease in infancy and middle age. He had no doubt about the scientific interest; it was more, it was almost a fascination. There was a periodical in the last decade of the past century, called *Teratologia, a Quarterly Journal of Ante-natal Pathology*, and it lived for two years; when it died there was the general admission that from the scientific point of view it had lacked nothing in interest, but there had been then no obvious sign that the subjects it dealt with had a practical bearing on anything else. That had in a large measure been altered now; and this brought him to the second reason, which was that the study of ante-natal health and disease was now recognized as having a direct influence upon the understanding of the health and disease which followed birth. The falling birth-rate had, with almost dramatic suddenness, brought ante-natal matters to the front; for, if there were to be so many babies fewer, then it was obviously important that they—the lessened crop—should all survive their birth, and should be of a quality which justified their survival. There could be no doubt that without serious study of ante-natal affairs there could be no marked improvement in race-health, and race-health was the watchword of the present day; eugenics was attempting to solve it, but eugenics without obstetrics and ante-natal pathology and hygiene would have but small success. Then there was the third reason, which required no elaboration. It had been irresistibly borne in upon him whilst watching over the pregnancy cases in the pre-maternity ward that there was an immense amount of suffering in and behind the few patients who came there for treatment. To not a few women the days and weeks of pregnancy were accompanied by far more distress than could be described under the euphemism of inconvenience; and to a few it was a time of torture. One had only to think of a bad case of hyperemesis or of acute hydramnios to recognize that. Surely there was need of further investigation of pregnancy and its pathology. By a kind of obstetric *coup de main* the introduction of chloroform and ether had shorn away the terrors of labour pains; one could hardly hope for any similar sudden abrogation of the sufferings of the gestation period, but one was justified in looking for a steady, if slow, amelioration of the troubles of pregnancy as the result of persistent and patient investigation of all that helped to make child-bearing normal, and of the various influences which tended to produce deviations from the healthy state.

For these three reasons, therefore, not to name others, he was sure that research in ante-natal pathology and hygiene, and in gestational morbid anatomy and therapeutics, was a pressing matter at the present time. He trusted also that the present discussion would act as a splendid stimulus to effort and adventure, for ante-natal pathology was still largely unexplored territory, and even gestational medicine and surgery was a land with few settlers in it. Neither, perhaps, could be or ought to be regarded as an El Dorado, but there was good, hard spade-work to be done, and there would be a reward of some sort for the doing of it.

Mr. G. F. DARWALL SMITH sent an account (which in his absence was read by Dr. Clifford White) of an investigation into some of the effects of the state of nutrition of the mother during pregnancy and at the time of labour, on the condition of the child at birth and during the first few days of life. The total number of cases investigated was 6,162. Figures to support the conclusions stated below were given in detail.

Summary.—Mr. Darwall Smith did not claim that his statistics absolutely proved anything, but he was inclined to think they suggested strongly the following conclusions: A state of bad nutrition of the mother at the time of labour, due to insufficient food, (1) greatly increases the percentage of dead births; (2) greatly increases the percentage of premature births; (3) slightly decreases the average weight of the full-time baby at birth; (4) greatly increases the post-natal infantile mortality; (5) has little, if any, effect during the first eight or ten days on the progress of babies who live during that time; (6) considerably increases the death-rate of babies during the first three or four days of life. A state of good nutrition of the mother at the time of labour, on the other hand, seems to (1) increase considerably the average weight of the full-time baby at birth; (2) increase the percentage of mothers who are able to suckle during the first eight or ten days of the puerperium, quite apart from the question of diet during this period of lactation. On the whole, it would appear that a state of average nutrition of the mother at the time of labour is best for both mother and child.

Dr. F. W. Mott, F.R.S., after thanking the President and Dr. Routh for inviting him to be present and take part in the discussion, stated that some years ago he had made a personal investigation of the family history of a number of cases of juvenile general paralysis with a view of showing that this disease is invariably caused by syphilis. Unlike the disease affecting adults due to acquired syphilis, where males exceed females by a proportion of four or five to one, the juvenile form affects the two sexes in equal proportions, the obvious reason being that the chances of infection are equal. In this inquiry he found that the family histories showed a number of interesting facts bearing upon the subject of ante-natal death which he considered under different groups. First he called attention to some generalizations. The usual history obtained was that the mother, after one or more miscarriages followed by abortions and stillbirths, had one or more children who generally died in early infancy of convulsions, hydrocephalus, or meningitis; later a child survived and at puberty or early adolescence developed general paralysis.

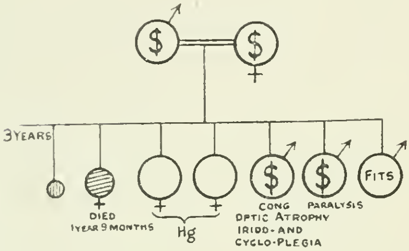
The histories of thirty-four syphilitic mothers gave 175 conceptions; these were made up as follows: 104 premature births or deaths in early infancy, 41 diseased in some serious form or another; 30 were *apparently* healthy, but many of these may have suffered later and certainly a considerable percentage of these apparently healthy children would have given a positive Wassermann reaction. In four instances the mothers were infected after marriage and after each had given birth to healthy children. It is of interest to note what followed in respect to conceptions before and after the mothers had been infected. Taken together there were fifteen conceptions before infection, resulting in the birth and rearing of fifteen healthy children. After infection there were twenty-two conceptions; of these thirteen were abortions, stillbirths, or children dying in early infancy; of the remaining nine there were five seriously diseased and there was no absolute proof that the remaining four were healthy.

The family history charts of a number of these cases of congenital syphilis, with a brief descriptive account, were then given. Each one was selected to illustrate some interesting point.

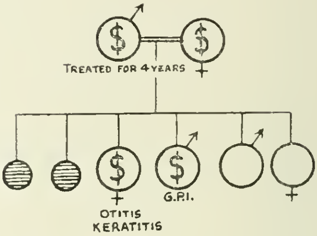
[Plain circles, *normal or apparently normal*; circle with $, *syphilitic*; half black circles, *general paralysis*; small shaded circles, *miscarriages, &c.*; larger shaded circles, *died in infancy.*]

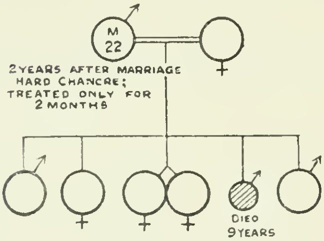
GROUP I.

1

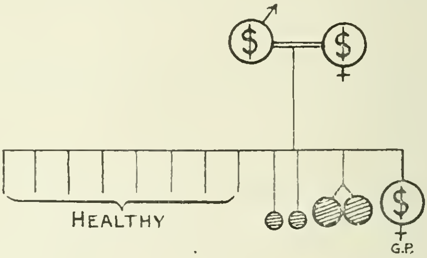


3





2



4

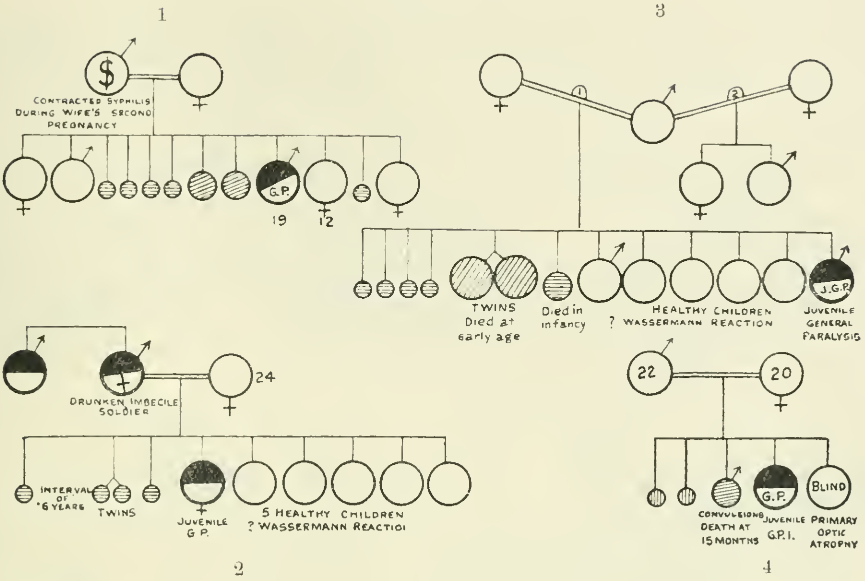
(1) To show the effect of treatment and later neglect of treatment of the mother.

(2) A mild form of syphilis of the father, later causing tabes. Inadequate treatment. Marriage two years after infection; the mother was probably not infected, therefore healthy family.

(3) Marriage five years after infection and, in spite of prolonged treatment, infection of wife. Syphilitic offspring.

(4) Large healthy family, wife infected; followed by two miscarriages, two born dead, and one living child who, at puberty, developed tabo-paralysis and optic atrophy.

Group II.


1
$
Contracted Syphilis During Wife's Second Pregnancy
G.P.
19
12
3
1
2
Twins Died at early age
Died in infancy
Healthy Children ? Wassermann Reaction
J.G.P.
Juvenile General Paralysis
Drunken Imbecile Soldier
24
Interval of 6 years
Twins
Juvenile G.P.
5 Healthy Children ? Wassermann Reaction
2
22
20
Blind
G.P.
Convulsions Death at 15 Months
Juvenile G.P.I.
Primary Optic Atrophy
4

(1) Man contracted syphilis during wife's second pregnancy—infected wife. Two healthy children now grown up. The infection was followed by four miscarriages or abortions, an infant which lived three months, an infant which lived only six months, and an intelligent child who, at the age of 14, became a general paralytic; then a daughter, aged 12; then a miscarriage; and, lastly, a frail little girl, aged 8. No evidence could be obtained of the mother having been infected beyond the results of conceptions, history, which is absolutely characteristic.

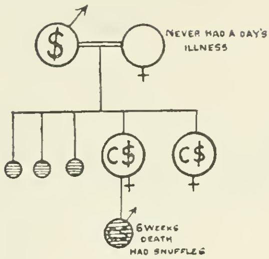
(2) Father an imbecile drunken soldier. A history was given by the mother of a miscarriage, six years later twins born dead, and then a stillbirth, followed by a child with signs of congenital syphilis and imbecile who at puberty developed general paralysis; later five children who were apparently healthy but who probably would have given a positive Wassermann reaction.

(3) This chart shows that the birth of apparently healthy children following abortions and deaths in early infancy is *no free pass*, for we find the last born male developed general paralysis. Doubtless all the apparently healthy children would have given a positive Wassermann reaction.

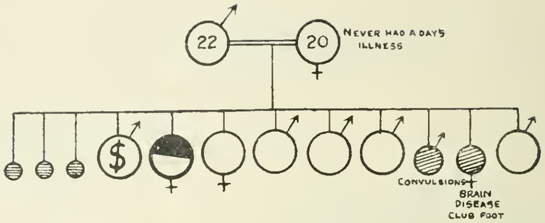
(4) Early age of marriage and virulence of infection. The father was aged 22, the mother 20. All the offspring were diseased.

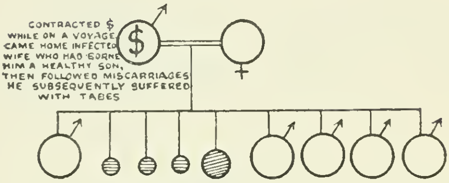
Group III.

1

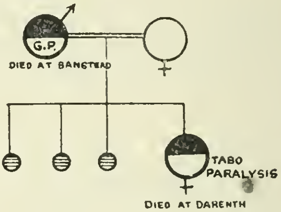


3




CONTRACTED $ WHILE ON A VOYAGE CAME HOME INFECTED WIFE WHO HAD BORNE HIM A HEALTHY SON, THEN FOLLOWED MISCARRIAGES HE SUBSEQUENTLY SUFFERED WITH TABES

2



4

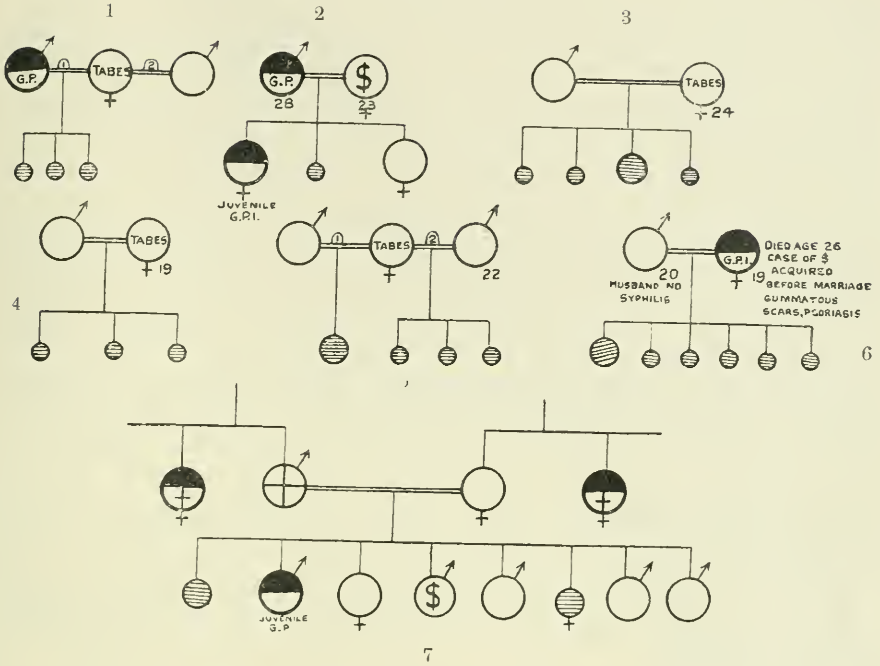
(1) Transmission to third generation. Two sisters with very definite signs of congenital syphilis. The mother gave a history of one premature birth and two children born dead. One of the sisters married, had a baby with snuffles that died at the age of 6 weeks. No history of syphilis of the father.

(2) Husband went for a voyage, came home and infected wife, followed by miscarriages and abortions, followed by four *apparently* healthy, probably latent syphilitics.

(3) Latent syphilis—*no free pass* to succeeding offspring. In this chart will be observed four *apparently* healthy offspring occurring between diseased offspring.

(4) Father general paralytic; infected wife. One miscarriage and two stillbirths, then a typical congenital syphilitic who developed tabo-paralysis.

GROUP IV.



(1) Father general paralytic; mother tabetic. Three pregnancies: Two miscarriages, one premature birth.

(2) Father general paralytic; mother syphilitic. Three pregnancies: (1) Juvenile general paralysis, (2) miscarriage, (3) healthy.

(3) Father healthy; mother tabetic. Four pregnancies: Two miscarriages, one child born dead, one miscarriage.

(4) Father healthy; mother tabetic. Three pregnancies: All miscarriages or abortions.

(5) Fathers healthy; mother married twice. Four pregnancies: One born dead, three miscarriages.

(6) Father *not* syphilitic; mother died of tabo-paralysis. Husband knew nothing of the history of the woman; she had an old syphilitic scar on leg which she hid from him. Six pregnancies: Child born dead, followed by five miscarriages.

(7) Latent syphilis in mother; father alcoholic, shown by circle in quadrants. Collateral insanity and alcoholism on both sides. Eight pregnancies: (1) Stillbirth, (2) juvenile paralytic, (3) apparently healthy, (4) congenital syphilitic, (5) apparently healthy, (6) death in early infancy, (7) and (8) apparently healthy.

Dr. Mott having shown the charts of these groups of cases, and briefly described the principal features of the histories, passed on to a consideration of Dr. Routh's remarks regarding spermatic infection and transmission of the disease to the offspring without infection of the mother. He agreed with Neisser, Plaut and others that the mother of a syphilitic child is herself syphilitic, although she may not show signs in such cases because the disease is latent. The fact that some mothers of syphilitic offspring have not given a Wassermann reaction did not to his mind prove that they had not been infected. Only a succession of tests with a 0·4 grm. salvarsan intravenous provocative injection could in the absence of a positive Wassermann reaction support this argument. He thought that there was no proof of the possibility of the infection of the spermatozoon by the syphilitic organism, even if an infective spore were admitted. Furthermore, Dr. Mott considered that his comparative statistics of the fate of conceptions of 22 tabetic or tabo-paralytic women with 54 tabic or tabo-paralytic men supported this conclusion, especially when taken in conjunction with Plaut's observations regarding the Wassermann reaction in paralytic men and women and their offspring, for Plaut had shown that 37 per cent. of the spouses of paralytic men and paralytic women gave a positive Wassermann reaction.

	Children alive	Born alive but died in infancy or later life	Born dead	Miscarriages and premature births
Twenty-six tabetic men ...	86	47	12	20
Thirty tabo-paralytic men ...	68	26	10	16
Total ...	154	73 Died in infancy or afterwards	58	
Fourteen tabetic women, four of whom were sterile; all gave a definite history and signs of syphilis on the body	6	4	14	16
Eight[*] tabo-paralytic women	10	8	—	16
Total ...	16	12 Died in infancy	46	

[*] Eight of the children dying in infancy, and five of the living children were contributed by one woman.

Adding the results of conceptions of the 54 married tabic and tabo-paralytic males together and contrasting them with the 22 married tabic and tabo-paralytic females, we find a remarkable difference in the fate of the conceptions. There were only sixteen children alive of 22 married tabetic women, about 0·7 per cent., whereas the males had three children on an average alive, which is very little short of the normal average; in fact, if it be admitted 4·5 is the average number *born* alive for each married couple the tabo-paralytic men have a normal average, a striking contrast with the women. In the case of the 54 tabo-paralytic men a certain percentage of the wives were infected, and this would well account for some of the 58 born dead and miscarriages, but we should find in 54 married men, non-tabetic or paralytic, a certain number of children born dead; consequently it is not necessary, taken in conjunction with Plaut's observations, to assume a hypothetical spermatic infection to account for the pre-natal mortality and the deaths in early infancy of tabic and tabo-paralytic men apart from a certain percentage who had infected their wives.

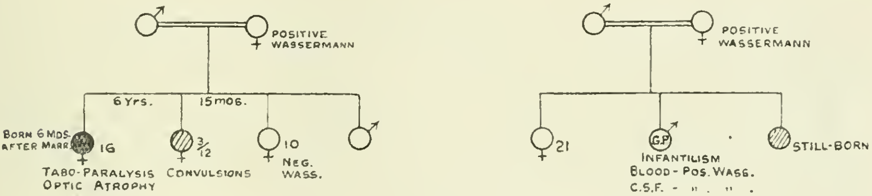


Fig. 5.

Dr. Mott then alluded to the histories of two cases of which he showed the charts (fig. 5). A boy, aged 18, the subject of infantilism and progressive dementia, was brought to him and he diagnosed it as a case of general paralysis. The boy was admitted to the hospital: the cerebrospinal fluid as well as the blood gave a positive Wassermann reaction; the fluid showed a lymphocytosis; there were no signs on the body of syphilis beyond the infantilism. The mother gave no history and said she had never ailed, yet gave a positive Wassermann reaction. Likewise a girl with optic atrophy and tabo-paralysis yielded similar results, and the mother proved also to be a latent syphilitic, for she gave a positive Wassermann reaction.

Finally, Dr. Mott referred to the examination of a series of stillborn and premature born fœtuses received from the Shoreditch Infirmary.

When he first undertook the Wassermann reaction it was necessary to have livers of syphilitic fœtuses for the preparation of the antigen; he therefore asked the various infirmaries to send him material. Dr. Fisher, of the Shoreditch Infirmary, informed him that since the commencement there had been 42 stillbirths or dead premature births and of these they had received 22. Spirochætes were found in 11 of these, so that we may conclude that at the very least of all stillbirths and premature births at Shoreditch 25 per cent. at the lowest estimate were syphilitic. If no selection had been made it would amount to 50 per cent., but of this he was not sure. Dr. Mott referred to the method he used of demonstrating the spirochætes in the brains of persons dying of general paralysis and of syphilitic fœtuses, and showed a lantern slide to show the organism was the same in the two conditions.

Dr. LEITH MURRAY considered that this was an occasion for the enumeration of the problems facing us in ante-natal pathology, and for emphasis on the need for research, rather than one for more particular discussion. He would confine his remarks, therefore, to a few general points on a section of this large subject which had especially interested him in recent years—the bearings of pregnancy on immunity production. He considered that there was much reason to suppose that the demonstration of this process in pregnancy would be no mere academical search, but would, possibly in the near future, lead to a pronounced alteration in our appreciation and treatment of the toxic conditions arising in pregnancy. The first step necessary was a demonstration to the general satisfaction that immunity reactions positively did occur in normal pregnancy. So far it could not be said that this stage had been reached. By "immunity reactions" he referred to such firmly established tests as complement fixation and sensitization reactions. His own work had convinced him that these do in fact occur, but it could not be denied that there was a tendency to be quietly sceptical of the isolated reports confirming their presence. To those few who admitted them, a very large field for investigation was thereby opened up:—

(1) The point of origin had to be settled—whether in the ovum as a whole or confined to the placental link.

(2) Their nature, essential or otherwise, had to be determined. In regard to this the analogy of other conditions where immunization was demonstrable strongly supported a very intimate connection.

(3) Their relationship to toxic pregnancy had to be studied.

Were toxic conditions in pregnancy an evidence of defective immunization or not? What was the significance of the "phase character" so evident in the histology of normal pregnancy, in the incidence of the ordinary toxæmias (hyperemesis, eclampsia), and to some extent in the immunity reactions?

Were these three factors capable of correlation?

In diseases coincident with pregnancy, as Dr. Routh had pointed out, there was a field for much research; for example, if anything was more remarkable than the exacerbation of exophthalmic goitre in early pregnancy, it was its occasional notable subsidence in the second half of gestation.

He had been rather surprised that evening to hear the Wassermann reaction referred to without qualification, and he considered that it might be advisable in the present juncture, when so great a difference existed between the original Wassermann and recent modifications, to indicate what technique was employed.

He concluded by urging that the main part of the research to be done on ante-natal pathology, particularly that on the immunology of pregnancy, was work for experts, more especially in serology and biochemistry. He trusted, therefore, that an appeal would be made to the Committee sitting under the presidency of Lord Moulton, for funds sufficient to carry on the campaign so admirably outlined by Dr. Amand Routh.

Dr. ERIC PRITCHARD said that he believed less was known about the influence of tuberculous disease on the embryo and fœtus than was known about the influence of syphilis. The diagnosis, whether clinical, laboratory, or post mortem, of tuberculous disease in the new-born infant was particularly difficult; it was still more difficult in the unborn baby. In the new-born infant there might be advanced tuberculosis, which gave no symptoms, either of temperature or nutritional defects. Even by the antiformin test tubercle bacilli were difficult to identify, and "tuberculosis sine tuberculis" was the rule rather than the exception. The only satisfactory means of diagnosis was by guinea-pig inoculation, but this was expensive and slow. F. Harbitz quoted a case of generalized tuberculosis in a mother who gave birth to a viable infant who lived twenty-five days. The mother died on the third day, and her uterus gave evidence of advanced tuberculous disease of the uterine wall, and especially of the placental site. If viable infants could be born with such advanced tuberculous disease of the uterus, it was highly probable that a large number of minor cases which escaped diagnosis also survived. Dr. Pritchard believed that a large number of cases of latent tuberculosis were to be found among new-born infants; he had watched the progress of a considerable number of infants born of tuberculous mothers. Most of these infants showed rather superior conditions of nutrition at birth, and for some time after, but definite evidence of tuberculous disease did not, as a rule, appear till a later date, although subsequent events often proved that symptoms which at the time could not be suspected of being tuberculous in nature probably were so from the first. Dr. Holt, of New York, believed from experience at the Infants' Hospital that a very large proportion of the fatal cases of so-called broncho-pneumonia in young infants were of tuberculous origin.

Dr. W. Camac Wilkinson said that he came to the meeting rather to support his old colleague, Dr. Amand Routh, than to offer any remarks of his own. Nevertheless, during the meeting certain points had arisen upon which he would like to say something. He was delightfully impressed by the lucid and able demonstration given by Dr. Mott, in relation to the effect of the transmission of syphilis to the fœtus. The speaker, more than fifteen years ago, definitely taught that the father could not convey infection to the ovum unless the mother was first infected. This idea was in those days scouted by the profession, and was contrary to the teaching of all text-books. Nevertheless, he held these views so decidedly that he could teach no other view, and it was gratifying to him to find that these views were now supported on the great authority of such men as Dr. Mott and Professor Neisser. He himself naturally taught that the infection in syphilis was similar to that of tuberculosis, and there appeared to him to be irresistible evidence that tuberculosis could not be conveyed by the paternal element. Upon this point the classical experiments of Gärtner left no alternative view. Infection of the embryo, or fœtus, though rare, certainly occurred through the mother. The rarity of the infection was explained by the simple fact that infection from the mother could only take place when tubercle bacilli were circulating in the blood. This was tantamount to saying that the mother was in a very advanced stage of pulmonary tuberculosis.

Even then infection was not common, because the tubercle bacilli being non-motile could only be forced into the tissues of the fœtus under extraordinary conditions. In rare cases tuberculosis of the placenta had been observed, especially in cattle, and this would account for the rare cases of congenital tuberculosis. The absence of tuberculous lesions in the fœtus thus had a far more reasonable explanation than the hypothesis advanced by certain authorities and just supported by Dr. Pritchard. Dr. Pritchard must first of all eliminate the constant possibility of infection after birth in the very early days of infancy, before he proceeded to argue that the infection might have occurred in the later, or even earlier months of pregnancy, even if producing a definite lesion. This assumption—the latency of tuberculous infection *in utero*—was not yet supported by any positive evidence. When one considered the physiological process of conception it was hardly conceivable that infection could be conveyed from the father to the ovum. It must be borne in mind that the ovum was fertilized by one spermatozoon. If the seminal fluid of a male with tuberculosis of the genital tract (testis, vesiculæ seminales) were examined, the spermatozoa were in myriads and the tubercle bacilli few in number. The chances were very much against the particular spermatozoon which actually impregnated the ovum carrying by its head or body a tubercle bacillus with it into the ovum. There would hardly be a thousand to one chance, even if the tubercle bacillus could cling tenaciously to the fertilizing spermatozoon. In fact, the more deliberately one pictured the process of impregnation of the ovum by the actively motile spermatozoon, the more difficult it was to give any credence at all to the view that the father, even though his genital organs be tuberculous, could transmit by the single activating spermatozoon tubercle bacilli to the ovum. But it was almost inconceivable that apart from tuberculous disease of these organs, infective agents could be conveyed by the spermatic fluid. Then even supposing a single tubercle bacillus were so conveyed, would it live and multiply? If it lived and multiplied, would the ovum survive or become blighted and die? It was a mere hypothesis that the tubercle bacillus might continue to live in a state of latency, and at some subsequent period renew its activity in reproduction and thus lead to a definite tuberculous focus. At least there was but little, if any, evidence that the single tubercle bacillus renewed its activity in intra-uterine life. If infection was observed many weeks after birth, it was impossible to exclude the imminent risk of post-natal infection.

The discussion had also touched upon the state of the mother's health in relation to the health of the child before and after birth. As a convinced advocate of the great value of tuberculin in the treatment of tuberculosis, the speaker had observed on several occasions that during a course of tuberculin, women who had been sterile for many years (six and seven years) might become unexpectedly pregnant. This seemed to show that the tuberculous condition of the mother might stand in the way of conception, in other words, be the cause of sterility. He had also used tuberculin for the treatment of several women about to become mothers, or with infants at the breast. In all, he had treated eight such women in the last three and a half years, and he was more than gratified at the extremely favourable outlook of such women when they had been treated with large doses. Pregnancy was held to be a contra-indication of tuberculin treatment until he had proved that it was nothing of the kind. In cases of several women he had given 1 c.c. of Old Tuberculin within a month or so of confinement; and in several cases the women had admitted, not only that the tuberculin renewed their strength, but seemed to help them to have a "good confinement." In several cases the tubercle bacillus disappeared from the sputum during treatment and had not reappeared. After the confinement the women did not relapse, and as a rule were much heavier than before treatment. So far he had had at least eight women who had been under such a course of tuberculin treatment, and it was gratifying to him that all the women were alive still, and far better than they had been before treatment. All the children were alive, and in really first-class condition. This picture, which included women who since treatment had had more children, one of them actually two, was in striking contrast to the picture furnished to them by text-books (*see* Osler's "Medicine"). Undoubtedly they were beginning to learn more of the mysteries of tuberculosis, but chiefly through the careful and prolonged observations of experts in such a research as Dr. Amand Routh advocated, and they must all be in sympathy with him. The first condition was that the research workers should be experts, and it would be necessary to pay these experts well for their researches. That would be far better than entrusting any part of the work to Medical Officers of Health, who were nowadays treated as beasts of burden for any and every kind of special work in medical science. Medical Officers of Health were rarely qualified to do research work, at least not in England, and if they were asked to undertake it someone else should be appointed to act as Medical Officer of Health.

Dr. Amand Routh, in reply, congratulated the Section on the discussion which had taken place, and incidentally upon the evidence which had been forthcoming that the importance of research in ante-natal pathology was becoming realized. He alluded to Dr. Newsholme's welcome statement that the Local Government Board had been so impressed with the value of this research that they had been able to make a grant to Dr. Eardley Holland and Dr. Ridge to enable them to embark upon the necessary laboratory research. Dr. Russell, of Glasgow, had also told the Section that a layman had given £3,000 to equip a laboratory in the Glasgow Maternity Hospital. The Section also had heard the suggestion of Dr. Leith Murray, of Liverpool, that the National Insurance Research Fund, which apparently amounted to about £57,000 a year, and which under Lord Moulton's chairmanship has already done so much for research in tuberculosis, should be used also for research in ante-natal pathology. He hoped this might be practicable, and this discussion would help forward any such scheme.

As regards the scientific results of the discussion, two or three things were evident: Firstly, that very little was certain as regards ante-natal disease, either as regards relative incidence, source or method of infection, prophylaxis, or treatment. In syphilis, for instance, the very existence of paternal infection of the ovum was denied by such an authority as Dr. Mott, and his lucid speech and diagrams clearly showed that paternal infection was infrequent. Many of his diagrams showed, however, that the mother had no clinical evidence of syphilis, and yet was delivered of infected children. Dr. Routh did not think that these were all cases of latent syphilis. When Dr. Mott collected further pedigrees with Wassermann reactions his figures would be more conclusive.

Dr. Routh saw no particular reason why paternal infection and fertilization of the ovum should not be simultaneous, nor did he see why the fertilized ovum freshly implanted upon the uterine mucosa could not be easily infected by the male parent's infected semen.

Tuberculosis, again, could not be as yet proved to infect the embryo or fœtus *in utero*, except in relatively a few cases, but he thought it very likely that tubercle did infect the early embryo, and if so its effect upon the delicate cellular three-layered blastoderm would be considerable, and could easily cause dystrophic abnormalities which would lead to early and perhaps unrecognizable abortions. Research must decide these points, as well as the curious fact that in syphilis spirochætes were but rarely found in the early embryo, and were yet found in abundance in the fœtus.

The difficulty of detecting tuberculosis in new-born children had been emphasized by Dr. Eric Pritchard, and Dr. Wilkinson spoke of Gärtner's view that tubercular infection of the embryo was possible in advanced maternal tuberculosis, but he did not believe in paternal tubercular infection of the ovum.

Dr. Routh thought that the excellent results obtained by Dr. Wilkinson by tuberculin injection during pregnancy were partly the result of being used at a time of improved physical condition of the tubercular mother, which almost always attended pregnancy.

Dr. Leith Murray's remarks on the placenta as an immunizing produce were very valuable, but very subtle, and showed that an experienced expert must undertake research work in this department of the subject, for all agreed with him that until we understood the physiology of pregnancy its pathology could not advance very far.

Mr. Darwall Smith's conclusions as regards the influence of malnutrition upon fœtal deaths, and premature births, were valuable, and would greatly encourage those who were trying to ameliorate the lot of pregnant women.

He hoped the discussion would greatly stimulate extended antenatal research.

Obstetrical and Gynæcological Section.

May 7, 1914.

Dr. W. S. A. Griffith, President of the Section, in the Chair.

Endothelioma of Uterus.

By Mrs. F. E. Willey, M.S.

The specimen was removed on April 7, 1914, from a single woman, aged 45. For three years the patient had suffered from increasingly profuse and prolonged periods, and for six months from recurring abdominal pain. There was no leucorrhœa. On examination, the uterus was found to be enlarged to the size of a three and half months' pregnancy; it was not tender. The appendages were normal and the cervix healthy and nulliparous. Sub-total hysterectomy was performed. On opening the uterus in the fresh condition a fluctuating, globular tumour was found bulging into the cavity, and on incision clear fluid escaped, and the cavity of the tumour appeared to be filled with soft lobular masses of the consistency of fat.

Pathological Report of the Specimen (by Dr. Helen Chambers).—The specimen is a uterus removed by supravaginal hysterectomy. It is much enlarged owing to the presence of a large mass looking like an intramural fibroid in the posterior wall. The uterus is almost spherical and measures 4 in. vertically and 4 in. transversely between the attachment of the Fallopian tubes. There are no subperitoneal fibroids, and except that the uterine wall is stretched the outer surface looks normal. An antero-posterior vertical section has been made through the specimen. In the posterior wall of the uterus there is a large solid tumour, 3 in.

in diameter, which has pushed forward the uterine cavity. The tumour tissue is white and soft, it has undergone degenerative changes, and in places looks like masses of coagulated serum. The edge of the growth, although circumscribed, is not well defined from the uterus; strands of fibrous tissue extend into the mass from the surrounding capsule of the uterine wall, and near the fundus the growth appears to be definitely invading the uterine muscle tissue. There is a capsule completely surrounding the mass which is ¼ in. in thickness. The growth does not invade the uterine cavity. The cavity of the uterus is elongated, and measures 4 in. in length. The endometrium looks normal. There is a flattened mucous polyp hanging into the cavity of the uterus, and attached to the fundus by a small pedicle. Its free edge is congested.

Microscopic Report.—The sections have been taken from various parts of the tumour. The uterine wall is invaded by masses of deeply stained growth. The tumour has a structure resembling sarcomatous tissue. It is composed of small spindle cells, the arrangement of which varies in different places. In some parts the whole tissue is composed of closely packed cells with little intervening tissue, in others the cells are arranged in narrow channels suggesting small empty capillaries, and in others the growth has the structure of a perithelioma, being formed of thick-walled tubes with a central lumen.

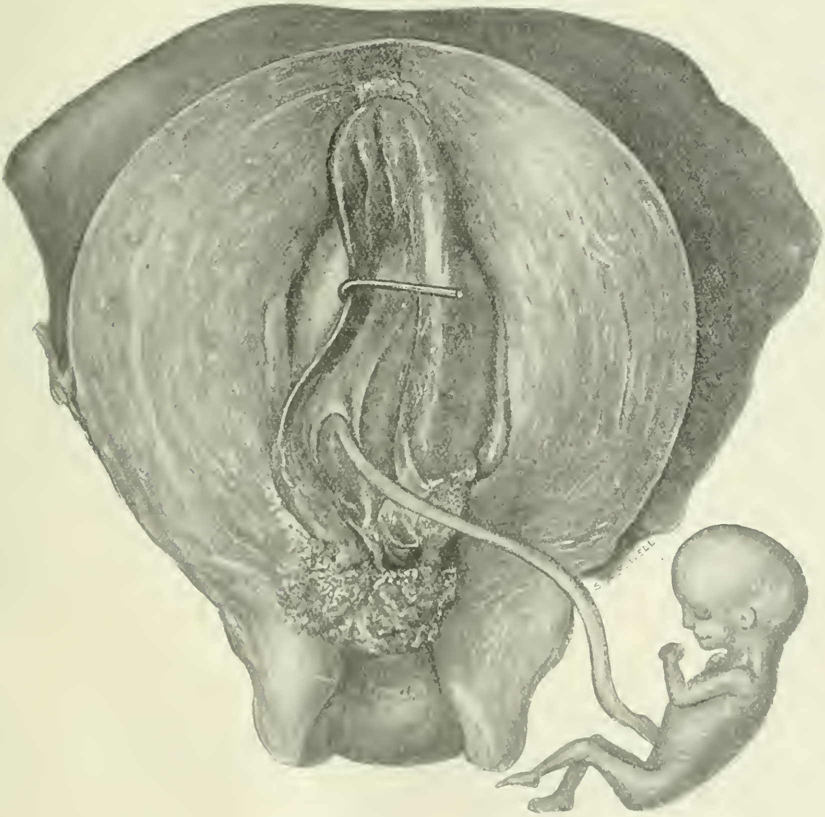
I think this growth is an endothelioma. The varied structure in different parts is a common feature of this type of tumour. In my opinion it is certainly a malignant growth, though I do not think the patient will have recurrence; the growth seems to have been completely removed and is surrounded by a fairly wide margin of uterine wall.

Report of the Pathology Committee.—The Committee reported as follows on the sections submitted by Mrs. Willey: "In our opinion the growth resembles the type described most commonly as perithelioma."

Partial Development of a Placenta on the Decidua Capsularis and Implantation on a Submucous Fibromyoma.

By Mrs. F. E. Willey, M.S.

The specimen shows a two months' pregnancy in a uterus with fibromyomata. The patient was a married woman, aged 38, the mother of nine children, the youngest aged 3. She came to the Royal Free Hospital in September, 1913, complaining that for two years she had suffered from profuse and irregular menstruation, and for the same time



Partial development of placenta on decidua capsularis and implantation on submucous fibromyoma.

menstruation, hitherto painless, had been increasingly painful. Under treatment all profuse hæmorrhage ceased, but a yellow discharge continued, which was blood-stained at the time when the menstrual period should have occurred. She was admitted for operation at the end of November, 1913. On opening the uterus an unsuspected pregnancy of two months' duration was found.

The specimen shows that the placenta is partly implanted on a submucous fibromyoma, but a considerable portion of it is developed on the decidua capsularis and lies immediately over the lateral os. It thus illustrates one possible method of formation of placenta prævia.

Fibroid Uterus with Red Degeneration and with Early Gestation.

By C. E. Purslow, M.D.

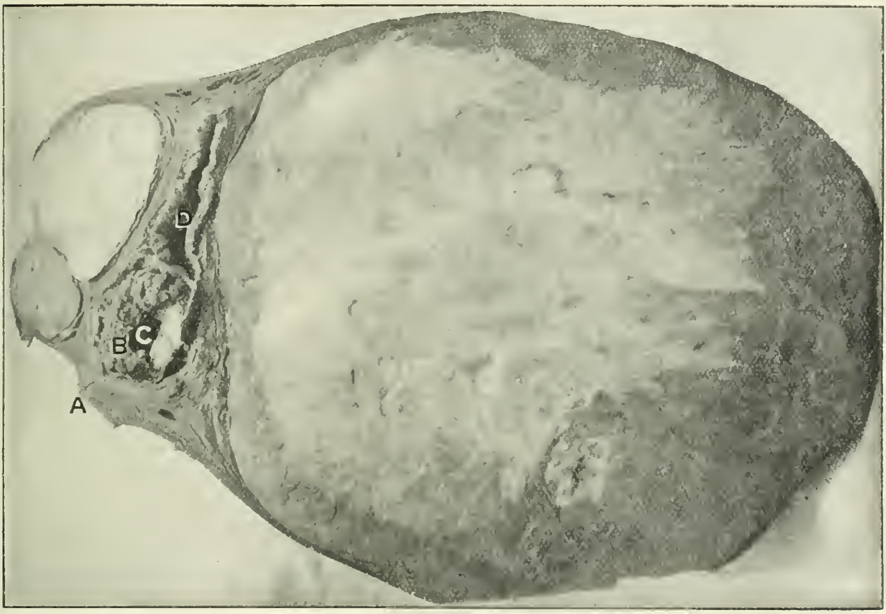
The specimen was removed by abdominal section from a married, and previously sterile, woman, aged 33. She had made no complaints until ten days before admission; her period was then due but did not come on. She was seized with violent abdominal pains, which continued up to the time of operation. She presented a firm, symmetrical tumour in the lower abdomen.

The specimen is divided sagittally, and shows a fibroid tumour the size of a four months' pregnancy in the anterior wall of the uterus; it has undergone well-marked red degeneration. The uterine cavity, which is spread out over the posterior surface of the tumour, is filled with blood-clot, in the centre of which is the sac of an ovum about ½ in. in diameter.

Uterus with Multiple Fibroids showing Gestation Sac situated over Internal Os (Placenta Prævia) and Empty Decidual Cavity in Upper Half of Uterus.

By C. E. Purslow, M.D.

This specimen was removed by abdominal hysterectomy from a married nullipara, aged 36, a patient of Dr. Frohwein, of Burton-on-Trent. She had been quite regular until ten weeks previous to operation, when her menses ceased, since then she had complained of abdominal pain, frequent micturition, and vomiting. The abdomen was occupied by a very hard tumour the size of an eight months' pregnancy. The cervix was slightly softened. The diagnosis of fibroids and pregnancy was made. As the situation and size of the fibroids appeared to preclude any prospect of the pregnancy going to term, operation was decided on, and an abdominal hysterectomy was followed by an easy recovery. The interest of the specimen lies in the fact that it illustrates one of the methods in which placenta prævia arises. The placenta, which is well defined, entirely covers the internal os, and the sac of the ovum can be seen to be contained in the lower half of the uterus, the upper half presenting a well-marked empty decidual cavity.



A, cervical canal ; **B**, placenta covering internal os (placenta prævia) ; **C**, sac of ovum ; **D**, empty decidual cavity in upper half of uterus.

Fœtal Bones removed from the Uterus Three Years after a Miscarriage.

By J. P. Hedley, M.C.

The specimen I show consists of seventeen pieces of fœtal bone. Some of them are easily recognized as pieces of long bones, but for the most part it is difficult to say definitely from what part of the skeleton they come. There is a complete humerus without epiphysis and two complete ribs. I removed these bones in February of this year from the uterus of a patient who gave the following history: She was aged 37, had been married eighteen years, and had had six children and later one miscarriage. She had had numerous operations in the last eight years—curetting twice for excessive bleeding eight and seven years ago, ovariotomy and ventral fixation six years ago, freeing of the uterus, perineorrhaphy and curetting four years ago. The miscarriage occurred three years ago at the fourth month, it was preceded by bleeding for two or three weeks and in the end was cleared out by a doctor. Since then the patient had suffered from very profuse yellow discharge and excessive periods.

On examination I found the cervix lacerated to the vault on the right side and the uterus bulky. I advised curetting and repair of the cervix. At the operation I put my finger into the uterus and found the endometrium apparently normal except at the fundus, where there was a thickened part about an inch square which bristled with spicules of bone. I curetted the uterus and repaired the cervix.

DISCUSSION.

Dr. Purslow said that he had met with one somewhat similar case. In his case he extracted almost the whole of the bones of a four months' fœtus, which were lying loose in the uterus, several months after a "missed abortion." In regard to the objection that this might have been a case of extra-uterine gestation, he would like to say that the abdomen was opened for another condition two years later, and no evidence that there had ever been an extra-uterine gestation was visible.

Dr. Hedley, in reply, said that he had every reason to think that the history was correct. There was nothing abnormal in the shape of the cavity, or of the uterus itself to indicate that the pregnancy had not been intra-uterine. The thickened part of endometrium was at the fundus near the mid-line.

Intussusception through a Gastro-enterostomy Wound occurring during Labour.

By HERBERT WILLIAMSON, M.D.

THE specimen I show to-night is perhaps of surgical rather than of obstetrical interest, for it is an example of an intussusception of the small intestine into the stomach through a gastro-enterostomy wound; the intussusception, however, took place during labour, and for that reason I show the specimen before this Section. I have not been able to find any record of a similar case in the literature relating to intestinal obstruction complicating delivery; the accident must therefore be a very rare one.

The patient, a thin and rather anæmic woman, aged 28, was admitted into St. Bartholomew's Hospital on February 24, 1914. She was in the thirty-fourth week of her second pregnancy; the last menstrual period occurred from July 1 to July 5, 1913. In 1908 and 1909 she suffered from symptoms of gastric ulcer, and for this reason two abdominal operations were performed in the Great Northern Hospital—one in March, 1909, and one in March, 1910. One of these operations was gastro-enterostomy, what the other was I do not know. She made a good recovery from the operations, and was apparently completely restored to health. Her first pregnancy ran a normal course; she did not suffer from severe vomiting, and a healthy child was delivered by forceps on June 10, 1912. Her second pregnancy commenced in July, 1913. During the month of October she suffered from morning vomiting and occasional vomiting in the evening; the morning vomiting ceased in a few days, but she vomited occasionally in the evening up to the month of December. On December 24 the vomiting became more severe, occurred one hour after every meal, and persisted until January 10, when it suddenly ceased; she did not vomit again until January 26. On that date vomiting recommenced, everything taken was returned, but she had no pain and said that she felt quite well so long as she took no food. She was admitted into hospital on February 14.

On admission the fundus uteri reached midway between the umbilicus and the ensiform cartilage, the child lay in the first position of the vertex, the head was above the brim, fœtal movements were not felt, and the fœtal heart was not heard. There was tenderness over the epigastrium, but the stomach was not dilated. The urine contained a trace of albumin and a considerable quantity of acetone and diacetic acid. During the night of February 24 she vomited occasionally, and the vomit contained altered blood; she complained a good deal of pain, her temperature was 96° F., and her pulse 80, and of rather small volume. At 8 a.m., on February 25, she spontaneously expelled a stillborn child, the placenta and membranes following shortly afterwards. There was no *post-partum* hæmorrhage. At 10 a.m. the stomach was found to be greatly distended, its outline was visible as low as the umbilicus, and a loud succussion splash could be obtained, but no peristaltic contractions were seen or felt. The patient looked very ill, and the pulse-rate had increased to 120. A soft stomach-tube was passed, a quantity of gas escaped, and about a pint of dark fluid containing a quantity of blood was drawn off. After this the stomach became smaller and peristaltic contractions were visible. Normal saline solution, with brandy and glucose, were administered by the rectum, the vomiting ceased, but the general condition did not improve.

I believed the case to be one of acute dilatation of the stomach, and at 2 p.m. I asked my colleagues, Dr. Thursfield and Mr. Gask, to see the patient with me. At this time she was cyanosed and collapsed, the pulse was 140 and temperature 101° F.; the stomach was again greatly distended, displacing the diaphragm upwards and reaching down to below the level of the umbilicus. The question of surgical interference was discussed, but the idea was abandoned on account of the general condition. The stomach-tube was again passed, three pints of blood-stained fluid drawn off, the stomach washed out with a weak solution of bicarbonate of soda, and 20 c.c. of normal horse serum passed in through the tube. The patient rallied for a time, but became progressively weaker and died thirty-six hours later.

On opening the abdomen post mortem the stomach was greatly dilated and distended, the greater curvature appearing from beneath the costal margin in the mid-axillary line and reaching to below the level of the umbilicus. The veins on the surface of the organ were distended with gas and there was interstitial emphysema of the omentum and tissues of the abdominal wall. On turning the stomach forward, recent lymph was found on both stomach and intestines in the neighbourhood of the gastro-enterostomy wound. The stomach was opened *in situ* and contained gas, dark-coloured fluid, decomposing blood-clot, and a large tract of intussuscepted intestine which appeared through the gastro-enterostomy wound.

The mass measured 15 in. in length and was coiled on itself and in the shape of the letter W; it was black, gangrenous, and friable: its free extremity was directed towards the œsophagus and was engaged in the cardiac orifice. The gastro-jejunostomy wound was completely obstructed by the intussusception, which consisted of the upper portion of the jejunum. The remainder of the intestinal tract appeared normal and was not collapsed.

Volvulus of the Cæcum occurring in Connexion with Labour.

By CLIFFORD WHITE, F.R.C.S.

THE patient was aged 26. She had had one child six years before and was expecting her second child in May, 1914. About four years ago she had had an appendix abscess drained in Hastings Hospital and the resulting scar had always been weak and prominent. Except for slight constipation the second pregnancy was uneventful for seven months, and then, as she had been more constipated than usual, she took a dose of castor oil on February 24, but vomited it. She therefore took further doses of oil on the next three days, but vomited after each dose; she was not, however, sick after her ordinary food on any occasion. After February 24 no satisfactory evacuation of the bowels was obtained, and on the night of February 25 some abdominal pain was noticed so that she sent for a midwife, but was told that she was not in labour. For the next few days she felt fairly well but kept in bed; she was, however, able to walk about a quarter of a mile on February 28 to ask her local doctor if her abdominal discomfort was due to constipation or to the onset of labour. About 1 a.m. on March 1 she was delivered of a dead seven months' child; the labour only lasted about an hour, so that the child was born before the midwife could reach the house. The midwife visited her again at 8 a.m., and gave her a dose of salts. Her pulse was then 70 to 80 per minute, and her general condition good. At 11.15 a.m., Dr. Lloyd, District Resident Medical Officer at Queen Charlotte's Hospital, visited her and found the pulse had risen to 140. The bowels had not been opened, but she seemed quite comfortable, and no physical signs were present to account for the increase in the pulse-rate. He ordered an enema, and then a second one, but no result was obtained from either. He asked me to see her early in the afternoon.

The patient was of a good colour, pulse 140, tongue furred; the abdomen was obese and distended, and there was a large hernia at the site of the appendectomy scar. The hernia was tense and irreducible; it was resonant on percussion, and the skin over it was slightly red. In the right lumbar region an indefinite mass was to be felt. No free fluid could be demonstrated in the peritoneal cavity. The rectum was empty, but the sigmoid contained fæces. The uterus was normal in size, there was increased resistance in both fornices, but owing to the fat and distension a satisfactory examination could not be made. The patient admitted to slight pain in the lower abdomen, but moved herself about the bed without apparent effort. I could not make a definite diagnosis. The physical signs might have indicated a twisted cyst or puerperal hæmorrhage into an ovarian cyst, a strangulated hernia into the scar, or a ruptured uterus, but it was quite obvious that her only chance lay in immediate laparotomy, so, as soon as arrangements could be made, she was moved to the Samaritan Hospital, and at 6 p.m. I opened the abdomen in the line of the old scar. The sac contained black offensive fluid, and the cæcum was found to be gangrenous and almost bursting. It lay partly in the sac and partly below it. The cause of the gangrene was a volvulus of the cæcum and about 3 in. of the ascending colon, which were twisted one and a quarter turns. General peritonitis was present. The cæcum, a few inches of colon, and 10 in. of ileum were removed and Paul's tubes tied in. At the time of the operation she was suffering severely from shock, but rallied well with the usual treatment. During the next few days the patient did well and the ileum drained very freely, but the signs of peritonitis increased on the fourth day, and death occurred on March 6. No autopsy was obtained.

The most interesting question is—When did the volvulus occur? This may have taken place between 8 o'clock, when she was seen by the midwife with a pulse of 70, and 11.15 o'clock, when seen by Dr. Lloyd with a pulse of 140. It might therefore have occurred as a complication of the puerperium, and the cæcum had become gangrenous in seven hours; or else the volvulus occurred during or before a labour that progressed so easily that the midwife could not be fetched in time. The other point of interest is the difficulty in diagnosing what may be the cause of collapse occurring in a patient soon after labour.

The Ætiology of Eclampsia and Albuminuria and their Relation to Accidental Hæmorrhage.

(An Anatomical and Experimental Investigation.)[1]

By JAMES YOUNG, M.D.

THE study of eclampsia (and the albuminuria of pregnancy) can be carried out from two points of view, the *clinical* and *anatomical*, which concerns itself with a description and interpretation of the symptoms and the morbid changes present, and the *experimental*, in which an attempt is made to reproduce these symptoms and morbid changes in the lower animals. The investigations here recorded were, to begin with, carried out along clinico-anatomical lines. From these preliminary studies there soon emerged an experimental line of inquiry. As a matter of fact, this was entered upon as a necessary test of the validity of the conclusions to which the preliminary investigations had led.

Within recent years most of the investigations into the cause of eclampsia have issued from the belief that the placenta is the most likely source of a poison, which all are convinced is the cause of the disease. There can be no doubt that pregnancy is the cause of eclampsia and that the poison is, at any rate, in its ultimate origin to be traced to the child or to the placenta. That it is not the child is proved by its occurring in cases of hydatid mole, where there is no fœtus. This leads inevitably to the conclusion that the direct or indirect source of the poison resides in the chorionic elements. That the relationship between the uterine contents and the toxæmic states is a very direct one is shown by their frequent immediate cessation after the emptying of the uterus, or after the intra-uterine death of the fœtus. On the other hand, even when the child dies *in utero*, the toxæmia may persist until the child and placenta are delivered. It would in such cases seem clear that the death of the child (the macerated state of which at delivery testifies to the time when this death occurred) must, by the consequent thrombosis of the vessels, prevent any poison which might have been produced in it from being conveyed to the placenta. The placenta, therefore, in such a case, must be the source of the poison; and to my mind, the only interpretation legitimate under such circumstances is that, although the placenta usually becomes detached from the uterine wall when the child dies, it may in some cases remain fixed. When this is so, it will continue to pour into the blood-stream the toxic materials and thus perpetuate the condition which killed the infant. We thus see that an analysis of apparently irregular and irreconcilable data leads to a simple explanation.

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[1] From the Royal College of Physicians Laboratory, Edinburgh.

It is impossible to gainsay the fact that there is an intimate and perfectly direct association between the uterine contents and the toxæmia. One fact, however, apparently inconsistent with such a view, is *post-partum* eclampsia. In about 20 per cent. of cases eclampsia occurs after labour. The great majority occur on the first day, and probably within a few hours after labour. No matter how we would explain these cases, we must inevitably start by admitting that something of a chemical nature has been left behind after the birth of the child and the placenta. We thus see that any experimental investigation into the cause of eclampsia must concern itself primarily with the attempt to isolate from the placenta (not from the child) some chemical substance that can reproduce the changes in animals.

RELATION BETWEEN ALBUMINURIA AND ECLAMPSIA AND PLACENTAL DISEASE.

It has for long been recognized that there exists a definite association between the toxæmic states and placental disease. On the other hand, infarcts of the placenta are not infrequent in cases where there is no sign of toxæmia. They are more likely to be present in the last two months of pregnancy, and Eden has suggested, with great reason, that they are to be looked upon as signs of senility in a short-lived organ. Their relative frequency has been differently stated by different authors. Meyer found them in 2 per cent. of 1,124 placentæ, Rossier in 17½ per cent. of 1,174, whilst Whitridge Williams found white infarcts, measuring 1 cm. or more in diameter, in 63 per cent. of 500 placentæ. Such figures, though exhibiting a wide margin of difference, leave no doubt regarding the relatively high frequency of the condition. On the other hand, there can be equally little doubt that these changes are associated in some special manner with the toxæmias, albuminuria and eclampsia. In Rossier's figures given above 54 of the women suffered from albuminuria, and, in these, infarcts were three times more common than where the urine was healthy. In Meyer's patients, where albumin and casts were present, infarcts were four times more frequent than where there was a normal urine. Fehling found them in 50 out of 91 albuminuric patients. "It is accordingly apparent," says Whitridge Williams, after stating these figures, "that the majority of investigators, who have busied themselves with the subject, believe that a marked relation exists between albuminuria on the part of the mother and infarct formation in the placenta." The infarcts, which are of greatest importance in this respect, are those of the recent or red variety. It is with them that albuminuria is especially associated. White infarcts, as such, seem to possess little clinical importance. Out of 7 cases of eclamptic placentæ examined by myself, there were massive red or purple infarcts in 5, whilst out of 6 cases of severe albuminuria, there were similar structures in 3. That is, in 13 toxæmic placentæ there was recent placental disease, evident to the naked eye, in 8—i.e., roughly 60 per cent.

"What is the meaning of this obvious association between placental infarction and the toxæmias?" is a question that has often been asked. Most workers admit that it is impossible to explain this relationship satisfactorily, or they attribute it to the action of the general toxæmia, of which the albuminuria is an evidence. For example, Eardley Holland, whilst admitting that infarcts are more frequent in albuminuria and eclampsia, says that "they may be looked upon as the result of a chronic toxæmia; as to their connexion with eclampsia, they are merely accompaniments, not consequences. The presence of these chronic degenerative changes in eclamptic placentæ has been investigated by Brindeau and Nattan-Larrier, who give them no special significance." Whitridge Williams, in a summary of the position, in so far as he could interpret it, said "marked infarct formation is not infrequently observed, and often results in the death or imperfect development of the fœtus. It is usually associated with albuminuria on the part of the mother, though at present we cannot account satisfactorily for the relation between them."

Placental disease of this kind has been usually looked upon merely as an accompaniment or as the result of the toxæmic state. So far as I know, no serious attempt has been made to regard the placental disease as the cause of the toxæmia, and this in spite of the fact that there is, in all the evidence which has accumulated through the years, not one single item which is logically inconsistent with such an interpretation.

It *is* true, then, that placental infarction may be present without any evident toxæmia. It is also true that there may be a severe toxic condition, and no evident change in the placenta. It is the very readiness with which the truth of these statements can be proved that has, in my belief, obscured the real nature of the relationship. To complete the statement of this relationship, where there is massive recent infarction there is always a toxæmia.

The meaning of this apparent paradox will become apparent when I say that, after I had been working at the subject for some time, studying the placentæ in their clinical relationships, I discovered that, *if there is an acute toxæmia ending rapidly in labour, the placenta may present evidence of disease, or it may look perfectly normal to the naked eye. If, on the other hand, the acute attack passes off and labour only supervenes, say ten or fourteen days after, we find extensive recent necrosis. Plate I, fig. 2, is a good example of such a case. This important finding at once suggested that it is the recent autolytic changes in the affected organ that generate the poison.* As I shall show, this conclusion from anatomical data is completely supported by the experimental results. It is this that explains why, in an albuminuria which becomes established gradually and persists for some time, one is more likely to find marked placental disease. *It is just the comparatively slow involvement of the placenta that allows of the continuance of the pregnancy and the evolution of the infarcted regions. Where there is a sudden and extensive involvement of the placenta, the toxæmia is so fulminant that the pregnancy ends before any naked-eye changes in the placenta are produced.* The import of these statements will emerge in a clearer light later when the experimental work is entered upon.

It should be remembered that the placental organ is unique in the sense that, if a part of its substance undergoes necrotic changes, the degenerating patch is a massive poison focus bathed all round by circulating maternal blood. A ready access into the systemic circulation of any toxic material is thus allowed. There is no other region in the body where such a condition of affairs could obtain.

It is easy to understand that a comparatively small placental disease may occur without any untoward effect. Under these circumstances the absorption of toxic products from the dying patches is so gradual, and, at any one time, so small in amount that it is tolerated. Where, however, this normal and limited change becomes excessive there is a pouring into the maternal circulation of more poison than the system can safely deal with. Such an explanation accounts at once for the presence of the toxæmia, where the placental disease is marked. I contend that it is a much more logical one than to suppose that the toxæmia develops independently and acts upon the placenta by hurrying up and exaggerating a process that is so common in a smaller degree as to be almost normal. The one view is an explanation of a relationship, the other is meaningless, except as the statement of an extraordinary coincidence.

Mild degrees of albuminuria are common in pregnancy, and may well be due to those cases of comparatively small placental involvement. An explanation, on the lines I have laid down, accounts likewise for the chief time incidence of the toxæmic states we are considering being in the last two months of pregnancy, just the time when the senile changes in the placenta are most likely to be in evidence. It accounts also for the very frequent cessation of the symptoms with the intra-uterine death of the child and the detachment of the placenta. This circumstance is due to the fact that the separation of the placenta withdraws the poison-laden foci from the maternal blood-stream, and the protective mechanism thus initiated is continued by the blocking of the open mouths of the maternal vessels by the thrombosis that quickly occurs.

THE CAUSE OF PLACENTAL INFARCTION.

(I) *General Anatomical Considerations.*

The placenta is a temporary structure, and is so constructed that it can come away readily during labour. It is only so closely incorporated with the uterine wall that shearing on this wall is prevented. As a matter of fact, naked-eye examination shows that all that serves to bind placenta to uterus are a number of thin films of decidua. As I have shown in another place, there are, in the uterine mucosa, none, or practically none, of the supporting elements, such as muscle, elastic tissue, &c., which are found in other regions. Derived as it is from the mucosa the same applies to the decidua. The vessels lose these supporting coats as soon as, or nearly as soon as, they enter the placenta. This fact must also be considered in relation to the loose connexion which is necessarily present between placenta and uterine wall.

If we examine the placenta still attached to the uterine wall, it is found that the thin decidual films, which attach the placenta, bridge across large venous channels. In point of fact, the placenta seems to rest almost entirely on a greatly expanded blood lake, broken up into individual spaces by the bridging sheets. Even to the naked eye one can see these spaces opening on the one side through the placental surface into the intervillous space, and, on the other side, becoming continuous with the sinuses in the muscular wall of the uterus. On the placental side the blood spaces are lined by a thin layer of compact decidua. As we know, from microscopic examination, this thin layer is complete practically all over the placental surface. Where the vessels perforate the placenta it is absent, and, in addition, here and there, comparatively large tracts on the surface may be seen where the villi dip straight into the blood spaces. It is through such openings that Veit believes there may be a wholesale "deportation" of villi into the maternal blood-stream. The separation of the placenta is rendered easier by an interesting change which occurs in the decidua. This consists of an œdematous loosening of the tissues, and is often seen in separated placentæ just under the compact layer (fig. 1), as also in the decidual plugs that extend from this layer into the substance of the placenta.

This arrangement between placenta and uterus is ideal from the point of view of ease of separation, but it obviously also means a ready tendency to vascular disturbance. There is a very loose organic binding, and to all intents and purposes the placenta merely rests against the uterine wall. When the child is expelled the retracting uterus grasps and expels the placenta, the soft decidual fixing strands offering practically no obstacle. During pregnancy there is nothing to disturb the placental fixation. It is known that the uterus contracts intermittently, but this can do nothing but empty the placenta of its blood. The liquor amnii will disseminate the tension equally over the uterine and placental surfaces, and it is likely that the constantly recurring intermittent uterine contraction, by expressing the placenta at definite intervals, leads to a heart-like, pumping action. The placental blood space is, in a sense, a greatly expanded maternal vessel. When a decidual vessel pours its blood into this a great diminution in velocity and force must take place, just as occurs when a river pours its waters into a lake. This circulating speed will become less and less as the small stream issuing from the vessel passes further and further into the placental blood lake and becomes wider and wider. The flowing force, therefore, in this space, derived from the *vis a tergo* of the general circulation, must be extremely low, and for an efficient passage of the maternal blood throughout and away from the placenta other factors must come into play. The recurring systole and diastole of the uterine muscle must, by exercising respectively a compression and a suction action, play an important part. We can imaginatively recognize the necessary existence of other factors. Thus, the villi are

PLATE I.

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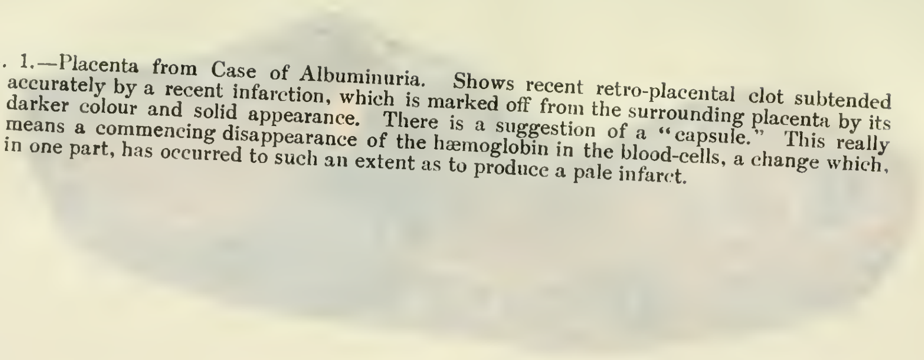

Fig. 1.—Placenta from Case of Albuminuria. Shows recent retro-placental clot subtended accurately by a recent infarction, which is marked off from the surrounding placenta by its darker colour and solid appearance. There is a suggestion of a "capsule." This really means a commencing disappearance of the hæmoglobin in the blood-cells, a change which, in one part, has occurred to such an extent as to produce a pale infarct.

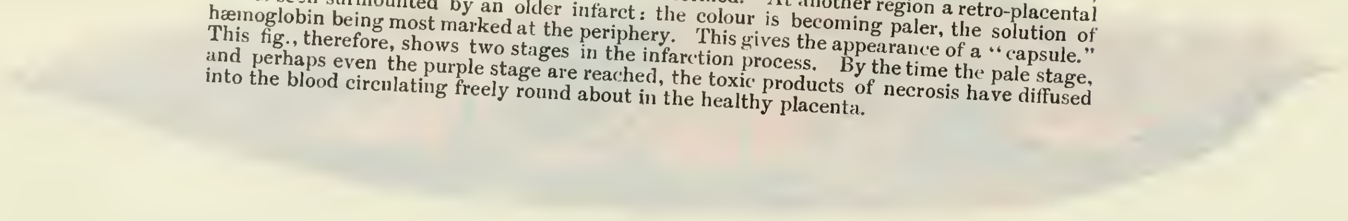

Fig. 2.—Placenta in Case of Eclampsia. In one part a large purple or recent infarct is seen, with no naked-eye indication of how it has been formed. At another region a retro-placental clot is seen surmounted by an older infarct: the colour is becoming paler, the solution of hæmoglobin being most marked at the periphery. This gives the appearance of a "capsule." This fig., therefore, shows two stages in the infarction process. By the time the pale stage, and perhaps even the purple stage are reached, the toxic products of necrosis have diffused into the blood circulating freely round about in the healthy placenta.

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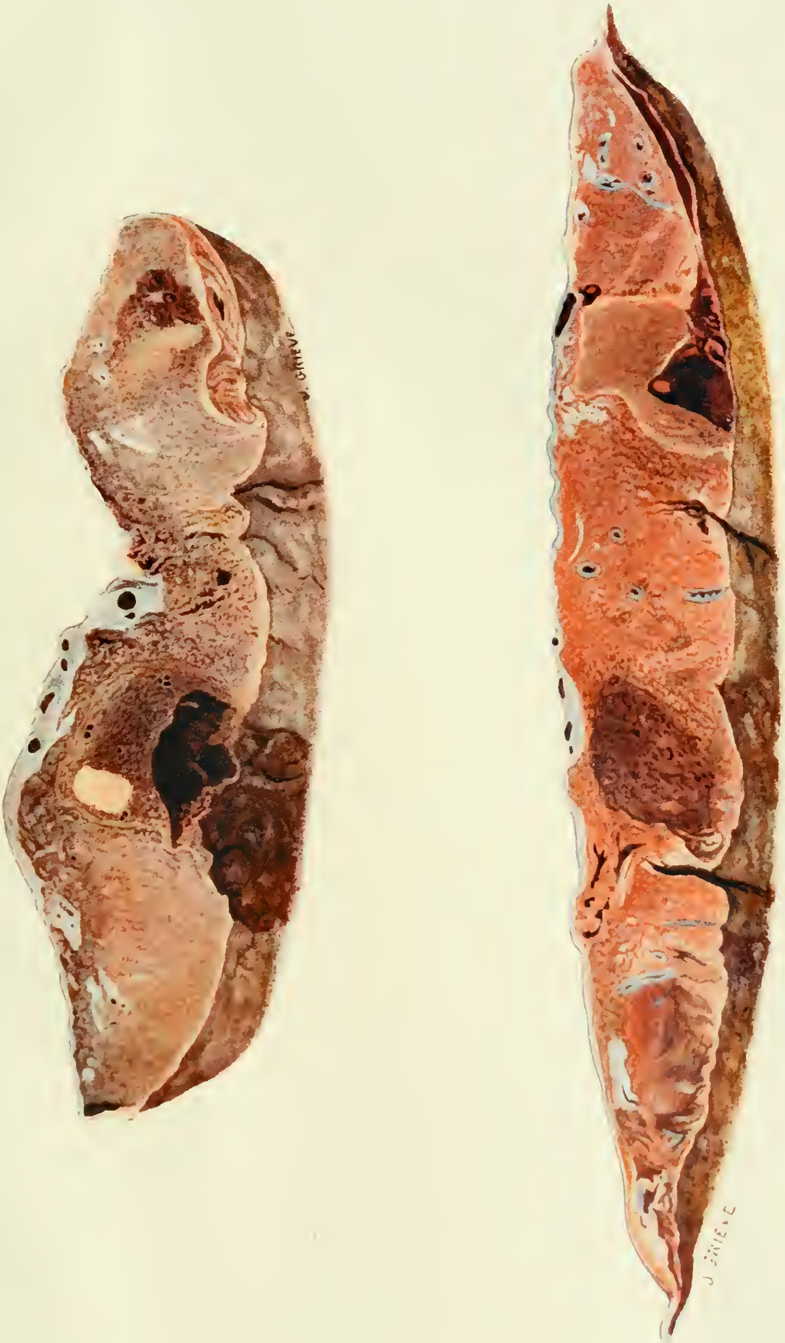

YOUNG: Ætiology of Eclampsia and Albuminuria. Plate I.

greedily absorbing fluid from the circumambient blood, and this must entail a continual mass movement of the blood in the space. Then, the taking up of oxygen and the other ingredients in solution in the blood, and the giving out of waste products, must mean a constant chemical alteration in the blood with constant diffusion currents backwards and forwards of the respective chemical ingredients in an effort to readjust the equilibrium.

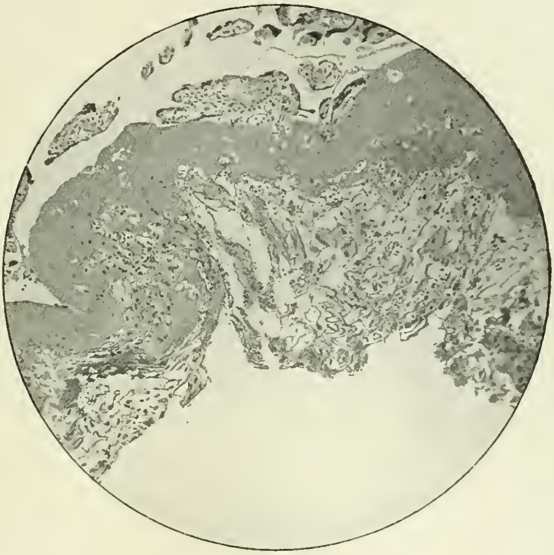

Fig. 1.

Decidual surface of placenta. Villi are seen above, then the thin compact decidua, and under this the loose decidua at the line of cleavage.

(II) *Changes Present in Localized Placental Death.*

Every person who has studied even a small number of placentæ is familiar with the so-called white and red infarcts. These consist of cubical, wedge-shaped, or irregular, sometimes sprawling, areas of yellowish or reddish tissue, which have lost the normal spongy appearance. They are firm in consistence. In the great majority of cases they lie with their base against the decidual surface. Sometimes an infarct may, at first sight, seem to lack this relation to the decidua, and to be embedded in the centre of the placenta or even to lie up against the chorion. In the majority of cases, however, on tracing the sections of the infarct, it is found to strike the decidua at a broad base. The oblique position of the infarcted region is what led to the erroneous first impression. In my experience, this decidual relation is so constant that it clearly must be considered as of great value and importance in any attempt to throw light on the causation of the condition. Many infarcts of the red or purple variety are difficult or impossible to recognize in the fresh placenta. When the placenta is put into fixing solution the blood quickly oozes from it, because in the healthy intervillous spaces it does not clot. (This it is which explains how rarely we find the villi embedded in blood in microscopic sections of placenta.) With the escape of blood the cut surface of the placenta, where it is healthy, becomes much paler. The diseased areas remain dark, and are thus thrown into relief against the paler background.

One fact which has emerged clearly from my investigations is that the various appearances included under the term "infarct" are different stages in one and the same process and not, as is often stated in the text-books, independent pathological states.

(1) In the earliest stage recognizable to the naked eye the patch is deep red, purple, or even black. *It may not be visible till thrown into relief against the surrounding paler placenta, which has lain for some days in the fixing solution, into which the unclotted blood in the intervillous spaces has oozed.* This stage is seen in Plate I, figs. 1 and 2, and Plate II, fig. 2. The patch stands out distinctly, and is sharply cut off from the surrounding, healthy placenta. In the very earliest stage this is all that is seen. When less recent, however, it is edged all round by a kind of capsule, seen on section as a thin whitish or yellowish streak (Plate I, fig. 1). Throughout the patch, black points and rounded spots are often visible, corresponding to blood in engorged villous vessels. In this stage the spongy character, though partly lost, has not quite gone.

(2) In this stage the colour becomes lighter. The dark red or purple becomes dusky brown, chocolate-coloured or brick-red. The spongy character of normal placental tissue has disappeared, and the patch cuts solid, the section showing a smooth surface all over (Plate II, fig. 1).

(3) In the older infarcts the colour becomes progressively lighter. The dark brown of the preceding stage becomes light brown, yellow, and then sometimes almost pure white.

That such a description of infarcts is the true one is proved by the fact that one can find, often in the same placenta, all the various stages between the earliest, purple, and the latest, white, stages. In Plate I, fig. 1, is shown a large infarct surmounting a large clot. That it is not quite recent is shown by the yellow "capsule," and by the fact that one

PLATE II.

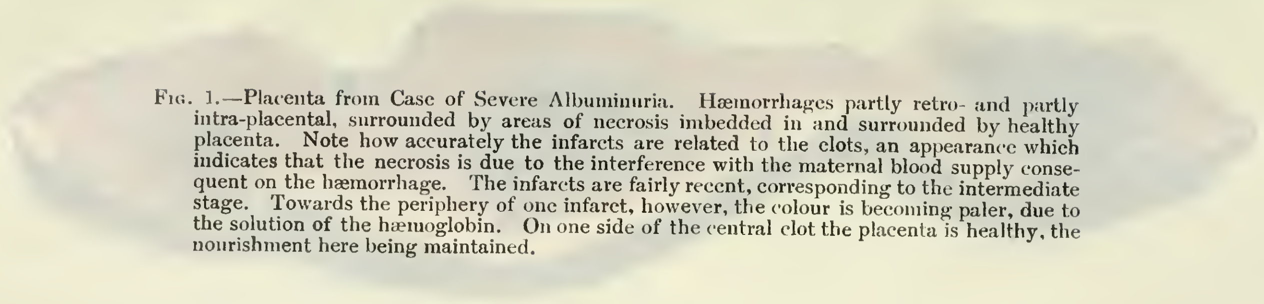

Fig. 1.—Placenta from Case of Severe Albuminuria. Hæmorrhages partly retro- and partly intra-placental, surrounded by areas of necrosis imbedded in and surrounded by healthy placenta. Note how accurately the infarcts are related to the clots, an appearance which indicates that the necrosis is due to the interference with the maternal blood supply consequent on the hæmorrhage. The infarcts are fairly recent, corresponding to the intermediate stage. Towards the periphery of one infarct, however, the colour is becoming paler, due to the solution of the hæmoglobin. On one side of the central clot the placenta is healthy, the nourishment here being maintained.

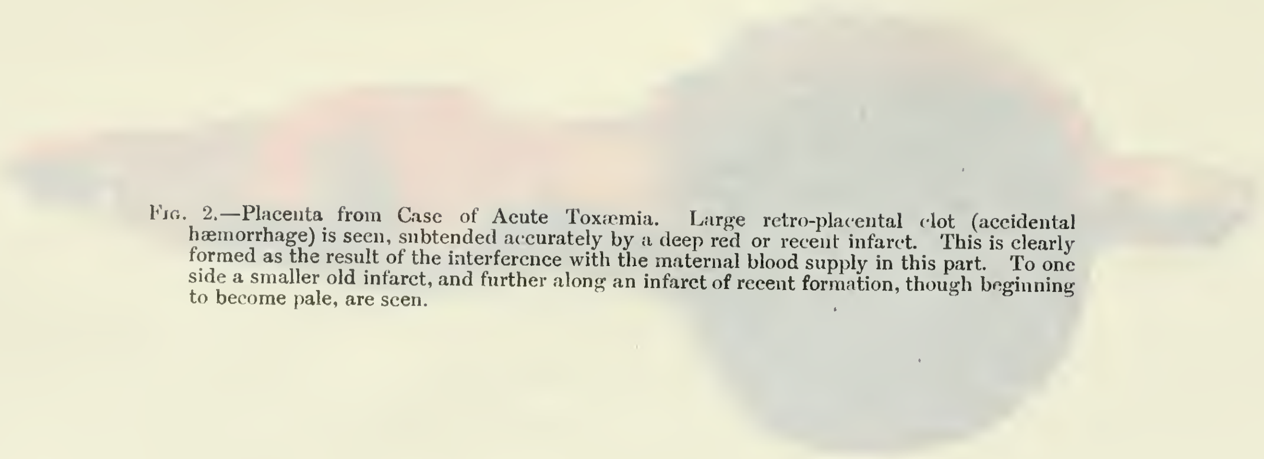

Fig. 2.—Placenta from Case of Acute Toxæmia. Large retro-placental clot (accidental hæmorrhage) is seen, subtended accurately by a deep red or recent infarct. This is clearly formed as the result of the interference with the maternal blood supply in this part. To one side a smaller old infarct, and further along an infarct of recent formation, though beginning to become pale, are seen.

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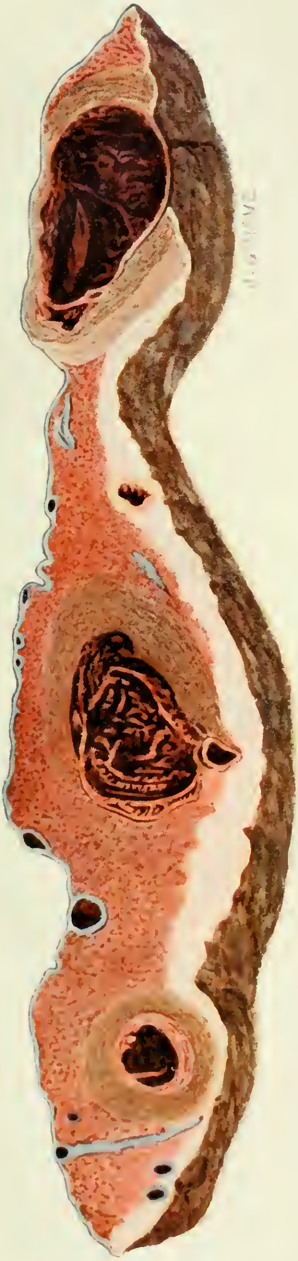

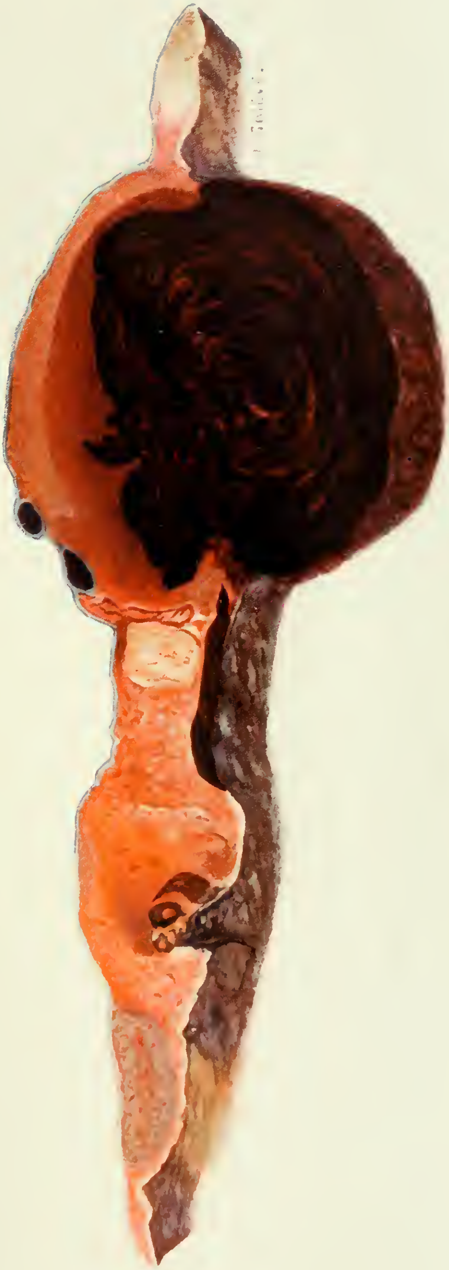

YOUNG: Ætiology of Eclampsia and Albuminuria. Plate II.

part has passed into the pale stage. No doubt if it had been left the whole infarct would soon have become similar in appearance.

What is the explanation of these changing colours? Why is the later stage pale whilst the early is dark? The first explanation that suggests itself is that it is associated with an alteration in the blood contained within the affected portion. That such is the case is proved by a microscopic examination of the various phases. To begin with, the villi are engorged throughout, the thin-walled capillaries in the small villi and the thicker vessels in the large villi are greatly expanded and are tightly packed with blood cells. In the small villi the vessel expansion may be so extreme that the stroma has become displaced to the periphery and there intervenes between the blood in the villi and that in the intervillous space only a very thin sheet of tissue (figs. 2 and 3). The purple colour of the fresh infarct is therefore due to the villi being turgid with poorly oxygenated blood. The whole appearance in this stage closely simulates the vascular hyperæmia and stagnation which occurs in other tissues when there is any local lowering in vitality, such as might result, for example, from injury. To my mind the engorgement, which is present in the early infarction, is of a smaller origin. It is an evidence of local reaction, which precedes the local death, that is inevitable when the blood supply of the part is cut off. In the later stages the blood within the villi, and any blood present in the intervillous regions, becomes paler and paler. The blood cells absorb the staining matter less and less. The hæmoglobin becomes completely removed and nothing but the shadowy outlines of the corpuscles are seen; or there may be a crumbling process, which results in a kind of granular debris—all that is left of the original blood cells. These stages correspond to the later stages of the infarction, and demonstrate readily the meaning of the phases presented by the changing nodule. It would thus seem that one of the chemical alterations occurring in the blood pent up in the vessels consists in a change in or solution of the hæmoglobin. Müller has shown that a similar change occurs during autolysis in the lung, and Mathes has reproduced the same change in the placenta by autolysis. In my experiments on placental autolysis, which I will record later, I have noticed the same result.

In association with these changes in the vessels and stroma there are other important structural alterations in the infarcted placenta. These have been carefully described by other investigators. One of the most frequent is a somewhat remarkable one. It consists of a *close packing* *of the villi* together throughout the whole or part of the infarct. In many cases the spaces between the villi are occupied, sometimes tightly, with blood cells. There may be at the same time a deposit of fibrin. This blood undergoes disintegrating changes similar to those already referred to in the villous blood. In the condition, however, which we are considering, the intervillous space is empty or nearly so, and the villi, instead of being separated from one another by comparatively wide intervals, as in the normal regions round about, have come close together. They may simply lie opposed to one another, or there may be an actual cohesion or fusion of the epithelial surfaces (figs. 2, 3 and 4). In such cases the vessels are usually, as in other infarcts, greatly expanded, but not necessarily so, and the condition cannot be attributed to a general increase in the size of the villi, caused in this way, with a corresponding crowding of them together. Eden, so far as I know, first specially pointed out this rather remarkable condition, and explained it as due to a "progressive diminution of blood supply to a part of a cotyledon, by obliteration of a maternal artery [which] would cause the villi to become crowded together because

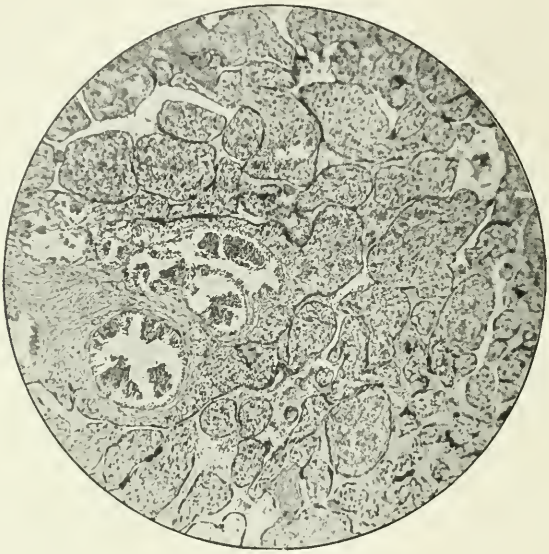

Fig. 2.

Recent (red) infarct. Villi packed together. Note the engorgement of the vessels. Case of accidental hæmorrhage without albuminuria.

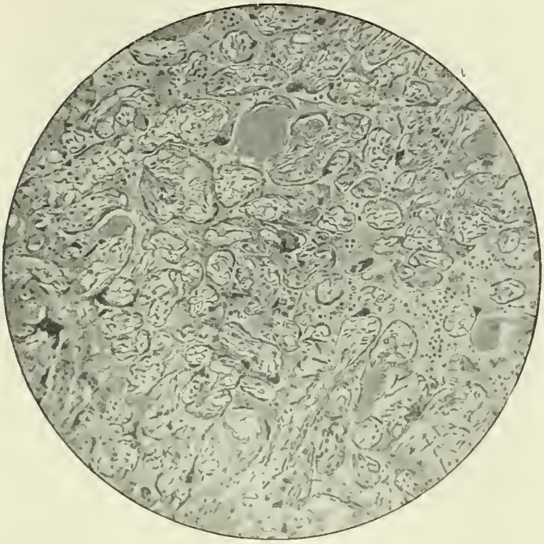

FIG. 3.

Old (white) infarct. Villi packed together. They are degenerated and poorly staining. The expanded vessels are well seen. The blood cells in these cases are pale, due to a disappearance of the hæmoglobin. Case of albuminuria.

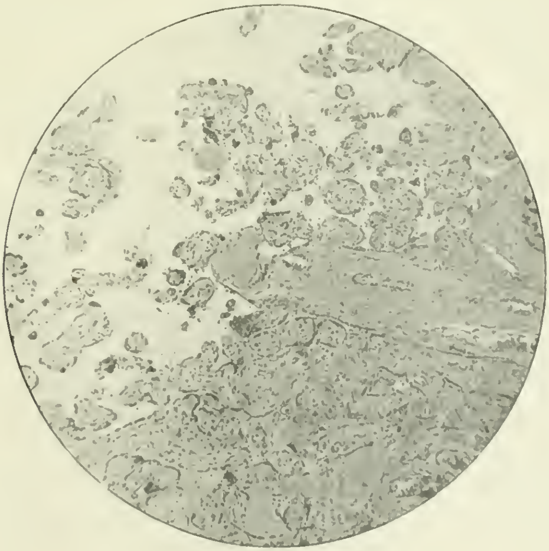

FIG. 4.

Edge of recent (red) infarct. To the right the densely packed villi are seen, to the left the healthy placenta. Case of albuminuria.

there would not be sufficient blood in the part to maintain them at their normal distance from one another." The pressure exerted by the rest of the placenta "would drive the villi together into a closely crowded, consolidated mass." This I believe to be the real explanation of the process. In other words, it must be looked upon as one of the possible changes where the local blood supply is disturbed. It will occur where the venous channels remain patent, or where the surrounding placental pressure can squeeze out the blood after obliteration of the afferent supply has taken place.

Clotting in the Intervillous Blood Space.—As I have already stated, one never finds any trace of coagulation in the intervillous space in the healthy placenta. In infarction a noteworthy appearance is the formation of fibrin, in the meshes of which red blood corpuscles are often entangled. *That this fibrinous deposit is not necessarily secondary to the changes in the villi is shown by the fact that we can often find it in conditions in which we definitely know there has been a stagnation of the maternal blood, and where the villi are healthy—e.g., accidental hæmorrhage.* As I shall show later the coagulation is primary; the necrosis, which later on occurs in such cases, being secondary. As the result of the examination of a large number of placentæ, healthy and diseased, I have convinced myself of the truth of this statement. When we find a fibrinous deposit between the villi we can be sure that there is some grave interference with the maternal circulation in the corresponding part.

The *other changes* in the infarcted regions, which result in a gradual disintegration and softening, have been fully referred to by other writers, and need not be detailed here. The epithelial layers soon show changes. In the earliest stages a proliferation of the syncytial nuclei, forming masses of darkly staining tissue, would seem to be a sign found specially and characteristically in this condition. Later on both layers of the epithelium become pale and eventually crumble away. Similar changes attack the stroma and the cells of the vessel walls. In the later stages the autolytic process results in a solution of the tissues, with the result that cavities may be formed in the centre of the infarcts. The degenerative changes often seem to start and progress most rapidly towards the centre of the nodules. In other cases they commence at the surface, as in the left-hand side of the infarct in Plate II, fig. 1, or in an eccentric position, as is shown in Plate I, fig. 1.

(III) Factors responsible for Infarction.

Whilst an understanding of the exact origin of localized placental death is not essential to my interpretation of the toxic process, I believe that the ultimate explanation of albuminuria and eclampsia must remain hidden until light is thrown on these changes. There have, in the past, been two opposing ideas regarding the origin of placental infarction :—

(1) Eden, Whitridge Williams, and others believe that it is due to a change commencing primarily in the villi themselves. Their blood supply is interfered with as the result of an obliterating change in the vessels. This leads to a degeneration of the epithelium and stroma of the villi, and secondarily to a coagulation of the maternal blood.

(2) Other investigators, such as Hofmeier, believe that the degeneration is due to an interference in some way with the maternal blood supply.

The first, and, in this country, the most commonly accepted idea naturally assumes that the villi are dependent for their nourishment upon the fœtal blood supply, and that once this is obstructed they must undergo progressive necrosis. If one could show definitely that the villous structures are independent of the fœtal blood, and, moreover, can live and proliferate when this is removed, so long as the maternal supply remains intact, it would render this explanation of the infarction process untenable. This is not difficult to do. There are several considerations which show it :—

(1) The time when the chorionic elements are most active and proliferate most rapidly is during the early stages of the development of the ovum, where there are, as yet, no fœtal vessels formed, and where the trophoblast and its villi obviously live directly upon the mother's blood.

(2) In hydatid mole the chorionic villi live, and, as we know, actively proliferate, when there is not a trace of a fœtal vessel, and when the entire nourishment is derived from the blood of the mother. The same is true of chorionepithelioma.

(3) In tubal pregnancy one can sometimes recognize the independence of the villi of the fœtal blood in a diagrammatic manner. Where there has been a considerable hæmorrhage into the extra-chorionic space great masses of villi become strangled in blood-clot. I have seen one such case where all the trunks in the neighbourhood of the chorion had undergone fibrinous necrosis, but near the tube wall, where, in parts,

the maternal circulation was unimpaired, the tips of the necrotic villi remained healthy (fig. 5).

These facts demonstrate beyond doubt that the villi, even after the fœtal blood supply is removed, can live, so long as the maternal supply remains uninvolved.

That the localized patches of dead tissue in the placenta are dependent upon an interference with the maternal blood supply is indicated by other findings of a positive nature:—

(1) As I have pointed out, in by far the largest number of cases, the infarcted areas lie in relation to the decidual surface. Moreover, in every such case one can detect degeneration, often necrosis, of the decidua. It is obvious that were infarction due to maternal causes, this is the disposition that would obtain.

(2) In large infarcts, resting upon the decidua, one sometimes can see, even with the naked eye, small nodules of healthy placenta on the outer or decidual aspect, which are obviously cut off entirely from the main part of the healthy placenta. Tracing in sections cut by the knife is sufficient to show this in such cases. This complete isolation of a healthy patch in a dead mass of tissue can mean one thing only, that whereas the remainder of the infarcted portion has lost its nourishment, the healthy nodule has retained its maternal supply. It is obvious that such a finding must be one of rare occurrence, but I have seen it twice, and in each case the healthy piece has rested against the decidua and into it healthy maternal vessels could be seen opening.

(3) *Retroplacental or Intraplacental Hæmorrhage as a Cause of Infarction.*—A consideration of the changes associated with placental hæmorrhage provides one of the most convincing proofs of the maternal origin of infarcts. Where there has been a hæmorrhage in the decidua serotina or into the placenta itself, there will be apt to be a local deprivation of the corresponding part of the placenta. The discovery of necrotic changes in these regions would be strong confirmatory evidence of the thesis I am trying to prove. As a matter of fact, it was the almost accidental discovery of this evidence that first convinced me of the fallacy of the usual explanation. One of the most surprising features of this investigation has been the great ease with which such evidence, and that of an unequivocal nature, has been obtained when it was looked for.

Where a retroplacental hæmorrhage is not quite recent one invariably finds the adjoining placenta diseased. The extent to which the necrotic process has gone depends upon the time during which the circulation has been cut off. Over old clots we see old, yellow, or white infarcts, whereas over young clots the infarction process is only in an early stage. Over clots of recent formation it may only be recognized on careful examination with the unaided eye, or it may not be evident without microscopic examination. In the earliest stages recognizable to the naked eye it consists of a deeply stained purple or dark brown patch, often difficult to recognize until the blood has been allowed to diffuse from the adjacent healthy placenta. In Plate I, fig. 1, this appearance is shown. The necrotic area was at first difficult to recognize. It is seen to be not quite recent, because it is sharply outlined by a pale yellowish margin. Figs. 6, 7 and 9 show infarcts subtending retroplacental clots (*see* also Plate II, figs. 1 and 2).

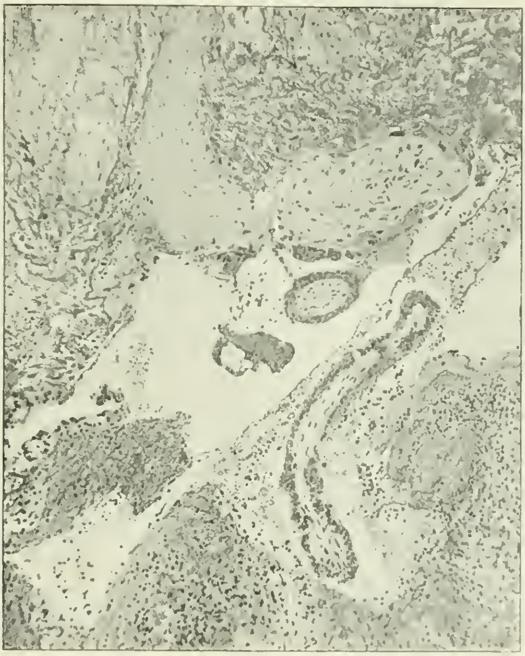

FIG. 5.

Tubal pregnancy. Above, the necrotic villous trunks are seen strangled in blood-clot. Below, the tips of the same villi are seen to be healthy where they lie in spaces in which the maternal circulation is maintained.

In view of what I have said there can be little doubt that we are here brought face to face with an infarct in the making. The objection that might be urged, that the hæmorrhage is secondary to the necrosis, is disposed of by the appearance, a common one, seen in Plate II, fig. 1. Here the solid infarcted portions are seen closely and accurately nestling round the clot. If the necrosis had been primarily developed it is obvious that any bleeding into the placenta would not have chosen to so displace the solidified tissue. It would have found much less resistance in the loose retroplacental decidua.

As is well known, hæmorrhage in the placenta is commonly associated with toxæmic states. Not infrequently, in fact almost always, one finds masses of blood-clot of varying age adherent to the maternal surface. The possible ætiological importance of these clots, to which formerly little attention has been paid, will be evident from the statements just made, and this ætiological significance will be seen to force itself upon us even more clearly when we study the conditions that obtain in accidental hæmorrhage. The bleeding, in the cases we are dealing with, is most frequently retroplacental. Over the blood there is a thin layer of compact decidua, which is invariably necrotic, when the condition has been present for a sufficient time. In other cases the bleeding may be within the substance of the placenta. Here again such clots are often surrounded by a necrotic layer of placenta (Plate II, fig. 1).

Whilst the observations I have just recorded are amenable to one interpretation only and supply us with evidence proving that, in these cases, the necrotic placenta is dependent upon an involved maternal circulation, in many cases, in fact the majority, we do not find this unmistakable evidence. It is true that the majority of infarcts are related to the decidual surface, but in many it is impossible on naked-eye or microscopic examination to be sure of their exact mode of origin. The decidua is usually diseased and the vessels are thrombosed, but these changes might quite well be, considered in themselves, secondary, and have usually been so considered. A little thought, however, will show that a very likely explanation of the hæmorrhage in the decidua, to which I have called attention, would be blockage of the decidual veins or the veins in the muscular wall—e.g., by thrombosis. This, in the presence of a free arterial supply, would tend to a backward pressure in the thin venous channels and would readily account for a hæmorrhagic escape, situated as they are in a soft unsupported decidua. Such an explanation has been actually advanced by Veit as the cause of the retroplacental bleeding in accidental hæmorrhage, though he has attributed it to a blockage of the veins by masses of deported villi and not to thrombosis. Be this as it may, I believe that the almost certain factor operating in these cases is a blockage in the veins, and the frequency with which thrombosis is found in the decidual vessels and veins of the muscular coat suggests rather that the responsible agent is an excessive occurrence of this change, which is so frequent during the later months that it may almost be considered normal (Friedländer). Where the vein also is blocked hæmorrhage will be the result. But this will only be one way in which the vascular changes will manifest themselves. *If there is a blockage of the artery, anæmia of the corresponding part of the placenta will occur* and this will be the only sign of the vascular involvement. That such is a very common factor in infarct formation is shown by the fact that a majority of the infarcts in my specimens show a close packing together of the villi into solid masses containing no blood in the intervillous space, *as if a kind of collapse has occurred subsequent to a cutting off of the entering blood*, just as collapse of the lung follows obstruction of a bronchus (figs. 6, 7, 8 and 9).

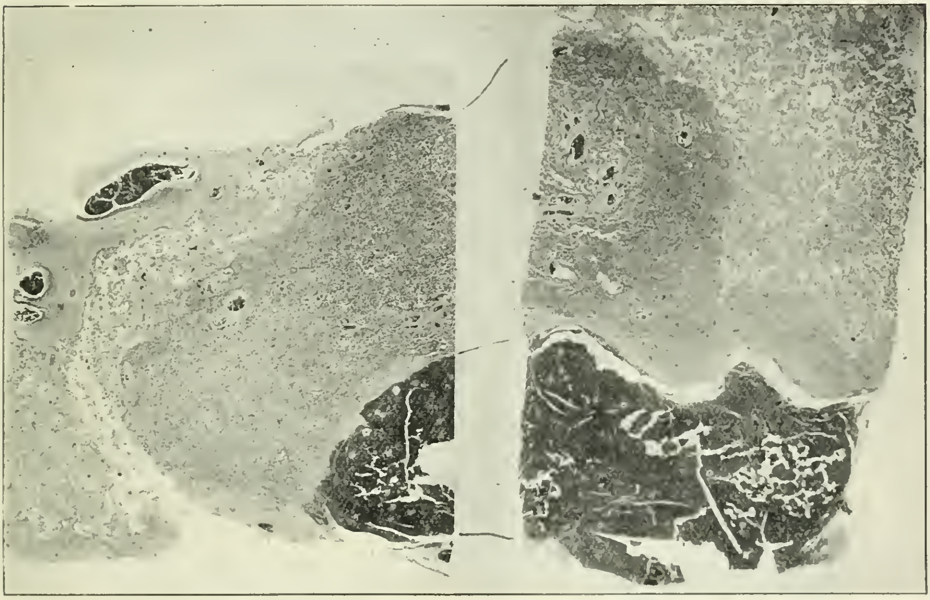

FIG. 6.

Recent (red) infarct accurately subtending retroplacental hæmorrhage. Shows dense packing of villi. The naked-eye appearance of this infarct is shown in Plate I, fig. 1. Case of albuminuria.

We may now summarize in a few words our conclusions regarding the origin of infarcts. In the first place, there can be no doubt that the chorionic elements are dependent immediately and directly upon the maternal blood for their nourishment, and can live and flourish where the fœtal blood is absent. This fact renders untenable the belief that infarction is due to an obliterating change in the vessels of the villi. A recognition of this fact leads inevitably to the conclusion that necrosis in the placenta will occur if the maternal blood supply is interfered with. I have shown that we can often find direct and undoubted evidence of such necrosis occurring in regions where there has been an arrest in the corresponding maternal supply of blood. Where there is an obstruction in the vein or veins hæmorrhage will be more likely to occur and will act as a signal post indicating the presence

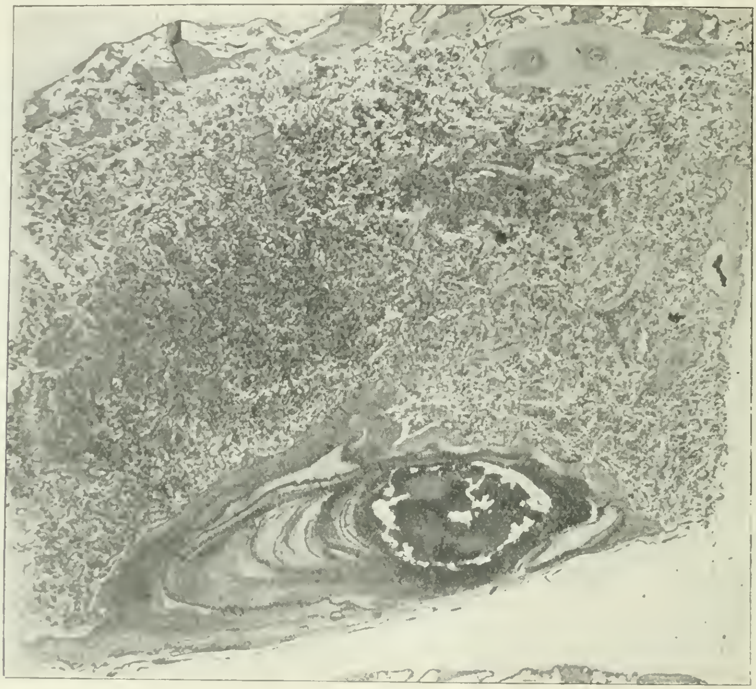

Fig. 7.

Recent infarct (invisible to naked eye in fresh placenta). The early stage of the consolidation process is seen in a region where the blood supply is cut off by thrombosis in the underlying vessel. Case of eclampsia.

of the obstruction. Where the artery or arteries are involved, alone or in conjunction with the veins, anæmia of the part of the placenta concerned will occur, followed again by necrosis. In such cases it may be difficult to find absolute anatomical proof of this mode of origin, but we may glean hints of its occurrence by a careful examination of the changes.

Remarks on the Maternal Circulation in the Placenta.

The observations I have just recorded indicate the fallacy of the usual idea regarding the circulation in the placenta. This is usually considered to be so free throughout, that any interference in one part is quickly made good by an inflow from the adjacent regions. The placenta is not to be looked upon as a loose sponge in which there is a kind of irregular mingling of the maternal blood. So far is this from the truth that I believe it more likely that, just as in other tissues, each portion is supplied by certain maternal vessels and relies on them entirely for the nourishment. By injecting some colouring matter into the centre of an isolated lobule one can easily satisfy oneself of its isolation from the adjacent placenta, so far as its blood supply is concerned, for only with great force can we drive the fluid beyond it into the other parts. We can easily understand that this must be so, when we

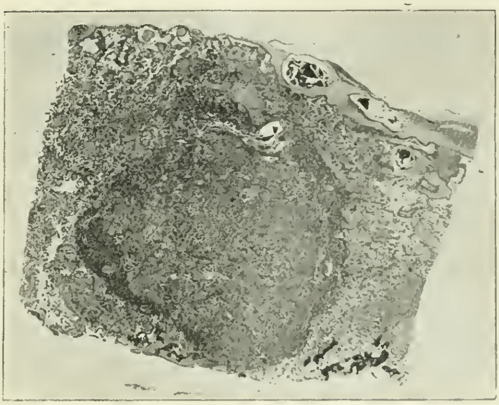

FIG. 8.

Recent (red) infarct. Shows consolidation process well advanced. In this there is no sign indicating how the maternal blood supply has been cut off. This information is often absent. Case of eclampsia.

remember that, in the natural state, the fissures between the cotyledons are occupied by solid columns or partitions of decidua, which often run up throughout the entire thickness of the placenta. During separation these septa are left attached to the uterine wall. The separation is rendered easy in these regions by the œdematous loosening of the decidua immediately under the compact layer, which occurs in the later weeks of pregnancy, and to which I have already alluded. Not only are the cotyledons independent of one another so far as their vascular supply is concerned, but differing parts of the same cotyledon are dependent on different vessels for their nourishment. In each of these areas there is a complete circulation, though, at the boundaries of such circulatory systems, it is probable that there is a mingling of the bloods.

RELATION BETWEEN ACCIDENTAL HÆMORRHAGE AND THE TOXÆMIAS.

Accidental hæmorrhage is a subject of great importance in connexion with the thesis I am attempting to establish. The evidence which it provides is pertinent to the discussion and is even more convincing and less confusing than that to which attention has been directed on the preceding pages. In accidental hæmorrhage we have a retroplacental bleeding, which occurs with greater or less rapidity and leads to a corresponding amount of placental detachment. It must be considered as merely an exaggeration of the hæmorrhage in a similar site, which is fairly common in the last weeks of pregnancy. There are all grades between the smaller hæmorrhages (Plate I, fig. 1), through the comparatively large bleeding shown in Plate II, fig. 2, up to the condition we are considering, where there is an excessive loss of blood. The special interest which this condition possesses for us resides in its close relationship to the toxæmias, albuminuria and eclampsia. Its affinity with albuminuria has been recognized since it was pointed out many years ago by Winter. Its relation to eclampsia was referred to by Essen-Möller in a contribution to the recent International Congress in London. Essen-Möller reported two cases from his own clinic which were associated with eclampsia. Seitz has recorded two, Winter one, Harry one, and Hartmann two. Moreover, Bar and Kervily have found in one case, where there were no fits, degenerative lesions in the liver similar to those present in eclampsia. (I quote these references to the literature from Berggren's paper.) Whilst this is so, one thing emerges clearly from the investigations on this relationship and is expressed by several of the authors—namely, that *it is impossible to look upon the toxæmia as the cause of the bleeding. For, in a large number of the cases, there is no trace of a toxic state.* For instance, in eight cases collated by Berggren, albuminuria was present only in four; in Zweifel's twenty-one cases there were thirteen cases without albuminuria. Essen-Möller brings out this same fact in a striking way. In 7,000 accouchements at the University of Lund, albuminuria was observed in 11 per cent., whilst accidental hæmorrhage was observed in only 0·45 per cent. He therefore says that "if albuminuria is a cause of retroplacental hæmorrhage, it is a cause of no great activity. But it is equally necessary to consider it from an opposite point of view. Out of my twenty-nine cases eleven showed albuminuria, and this figure rises to seventeen if we include cases with a trace only. So that whilst albuminuria is seen in only 11 per cent. of confinements, it is seen in 37 to 50 per cent. of cases of accidental hæmorrhage. It therefore seems to me that we can draw from these facts a second conclusion—namely, that the frequency of albuminuria in retroplacental hæmorrhage suggests something more than the idea of a coincidence pure and simple."

Such a condition of affairs, otherwise an admitted mystery, is readily explained in terms of the interpretation of the toxic states which I have already advanced. In accidental hæmorrhage we obviously have a corresponding part of the placenta cut off from its blood supply. If the hæmorrhage develops and extends so rapidly that it quickly kills the patient or determines a complete separation of the placenta, either naturally or by the interference necessitated in the patient's interests, there will be no opportunity for the necrotic changes to develop and there will be no toxæmia. The nature of the condition is such that termination in one or other of these ways must be common, and readily accounts for the fact that in about 50 per cent. of such cases there is no toxæmia. But, if the placenta remains attached at one part for some hours or days, the circulation there will remain undisturbed, and there will be an opportunity for the discharging into the maternal blood of the toxic ingredients, quickly elaborated by the disintegration of the separated portion. Only in such cases will an albuminuria or an eclampsia develop. As in the retroplacental hæmorrhages of smaller amount, so here it is easy, in cases where the blood-clot is not quite recent, to demonstrate the infarction changes in the severed portion or portions. The degree to which the change is manifest depends on the time that has elapsed since the bleeding occurred. I have had an opportunity in my specimens of recognizing only the earliest stages.

When present they are, however, distinct. On some occasions they have been found only after microscopic examination in a placenta that looked quite healthy to the naked eye. The discovery of these changes must be looked upon as strong confirmatory evidence in support of the truth of the reasoning which had foretold their existence. I shall refer, later on, to the question of the ætiology of accidental hæmorrhage, in so far as we have facts that permit of such an investigation.

I regret that a complete clinical history, so far as albuminuria is concerned, was obtained in none of my specimens. Whilst this would have given added interest to the discussion it is, however, not essential. For the study of the anatomical changes in accidental hæmorrhage I have had one complete uterus, to which the placenta is still attached, and eight placentæ, as well as pieces removed from the uterine wall from four cases of fatal accidental hæmorrhage.

Changes in the Placenta.

The alteration in the placentæ varies with the age of the clot and the amount of separation that has occurred. In one case, in which there was not much hæmorrhage, there was no albuminuria. The labour ended soon after the first onset of the bleeding. In it an interesting appearance was found. The blood-clot was quite fresh. The placenta was examined soon after removal, and it was noted that the part of the placenta (about a quarter of the whole) that had been severed from the uterine wall was deeply congested as seen from the amniotic surface, the remainder being quite pale. This appearance corresponds to the earliest stage of the degenerative process, which is characterized by an expansion of the vessels in the villi. It would seem to be analogous to the congestion that occurs round an infarct in other parts of the body. The unaffected vessels undergo a rapid engorgement after the cutting off of the blood to the affected part. In the placenta the vessels of the villi, in which the circulation is primarily uninvolved, undergo a similar engorgement. For the rest, the degenerative changes in the placenta are similar to those which I have already described under the heading of infarction in general. In this condition, of course, they are more extensive, as large masses of the placenta, or even the whole placenta, are apt to be deprived of their blood supply. The changes may be equally developed in the affected parts or, where differing regions have been detached at different times, the changes may be more marked in some places than in others. One of the first changes to develop is a *fibrinous deposit in the intervillous space.* As I have already pointed out, this is to be looked upon as a certain sign of severe vascular involvement. It may be present before any visible changes have occurred in the chorionic elements. In the majority of cases, however, where it is found there has occurred a congestion of the villous vessels (fig. 2).

In fig. 9 is seen another typical appearance found in these cases. A small recent clot is adherent to the decidual surface. Subtending this clot there is a region of definite consolidation in the placenta; in other words, a commencing infarct. It is localized to the region of the clot, and, even on naked-eye examination of the section, *the villi can be seen to be densely packed together*, the looser placental tissue all round being seen. Under higher magnification fibrinous threads are seen between the villi, and the vessels in the villi are greatly expanded. The epithelial covering of the villi is not obviously diseased. This section is taken from a placenta near a huge clot which had severed practically half of its surface from the uterine wall. As the result

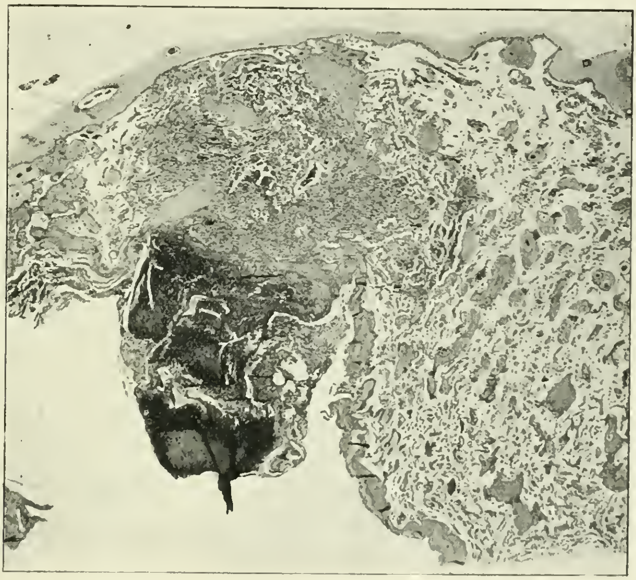

Fig. 9.

Recent (red) infarct subtending retroplacental clot. This infarct was invisible to the naked eye. Case of severe accidental hæmorrhage without albuminuria.

of the accumulating blood the placenta had been so compressed that its thickness was reduced by one-half, and in some places by two-thirds. Throughout this enormous piece of placenta changes similar to those just described were found—i.e., there had taken place a huge early infarction.

At first sight it might seem possible to explain the degeneration in these cases as due to the compression of the blood-clot, and no doubt this must play a part in the devitalizing process. That it is not the necessary factor, however, is shown conclusively by the occurrence of the changes in placentæ, in which a ready detachment has occurred without any obvious compression having taken place. This is, as a matter of fact, the usual condition of affairs. In these cases we find the intervillous coagulation and the congestion of the villi in the earlier stages, and the necrotic changes in the villi in the later stages. As I have said, a packing of the villi into solid masses, suggesting a collapse of the placental substance, is present in the majority of such cases. It is doubtless due to the anæmia of the part attendant on the interference with the blood entering, and, although the veins are almost certainly involved, and a leakage away along the normal channels is thus rendered impossible, the forcing of the blood out of the intervillous spaces into the surrounding, less involved, intervillous regions is probably a matter of comparative ease. Especially is this likely in view of the fact that, at the confines of the individual circulatory systems in the placenta there is probably under ordinary circumstances a certain mingling of the bloods. *In any case, the appearances leave no doubt of the fact that when the blood supply of any part of the placenta is interfered with, collapse and solidification is likely to occur.*

The appearances in the one case of accidental hæmorrhage in which I have been able to make a complete study of the placenta in situ are interesting. The placenta was completely separated by a huge blood-clot except at one edge. The hæmorrhage is completely retroplacental, a fine layer of compact decidua covering the outer surface of the placenta. There were, throughout the separated part, changes such as I have referred to. The placenta is pale throughout, except at its attached edge, where the most recent disintegrative change is seen, in the shape of a large purple patch. It is clear that this is just the region where the most recent evidence of a degenerative process will be evident. It is the last part to be separated. As I have indicated on a preceding page, the purple colour soon gives place to a paler hue as the autolytic process leads to a solution of the hæmoglobin. This is the condition of the remaining part of the placenta. After an examination of such a specimen one can be left in no doubt whatever that the disease in the placenta is secondary to the deprivation of the maternal blood supply.

Changes in the Uterine Muscle, Decidua, and Vessels in Accidental Hæmorrhage.

The chief subject for this study has been the complete uterus, to which I have just referred. For this specimen I am indebted to Professor Kynoch, of Dundee. I have, in addition, been able to study sections cut from four complete uteri from fatal cases of accidental hæmorrhage. These are in the Museum of the University of Liverpool, and, naturally, the chance of anything like a complete investigation of them was impossible. For them I am indebted to Professor Briggs. My remarks will be chiefly directed to the specimen of Professor Kynoch. In it a thorough examination was made. The other specimens served to provide confirmatory evidence of much that it demonstrated. The complete specimen consists of the uterus removed after death. The specimen was shown to the Edinburgh Obstetrical Society last year by Professor Kynoch, and I need not refer to the clinical history. The uterus is occupied by an immense blood-clot. The placenta has been detached by this, except along one edge, where it is still adherent to the uterus. There are marked and important changes in the muscular wall and in the decidua.

Changes in the Decidua.—These were discovered purely by accident as the result of the way in which the specimen was cut. The decidua vera is deeply congested. In the sections the *vera* is marked by a deep red line, and is obviously the seat of diffuse hæmorrhage or of vascular congestion. Microscopically the appearance was found to be due almost entirely to an enormous expansion of the decidual vessels into thin-walled sinuses. Here and there areas of hæmorrhage are present (fig. 10). In the adjoining muscular wall the vessels are in a state of congestion, and surrounding them there may be scattered hæmorrhages, but the changes here are nothing like so evident as in the decidua. The congested vera can be traced directly (even by the naked eye) into the serotina under the placenta, where the same vascular changes are present in an even more marked degree. In the *serotina* the vascular expansion is excessive, and there is an extensive blood leakage into the surrounding tissues. It is obvious that it is to the congestion and hæmorrhage here present that the enormous blood escape into the retroplacental space is due.

Changes in the Muscular Coat.—In no place is there any evidence of degeneration of the muscular tissue. In many places there is an expansion of the vessels, and an œdematous escape. In the muscular coat underlying the placental site (and also, but to a less extent, in that under the congested vera) the vascular changes are most evident, and here a hæmorrhagic leakage through the vessel walls has occurred. These appearances Essen-Möller and others have previously described. In one of my other specimens there was an extensive hæmorrhage into the muscular coat, which was visible as a deep purple patch under the peritoneum over the greater part of the anterior surface of the uterus.

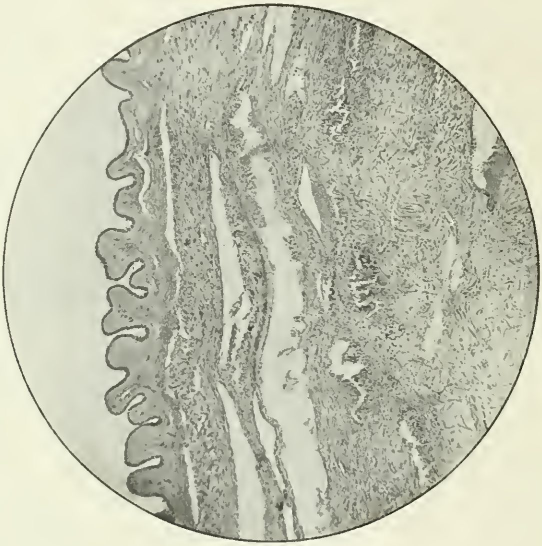

Fig. 10.

Accidental hæmorrhage (Professor Kynoch's case). Piece of uterine wall beyond the placenta. To the left the amnion and chorion are seen, then the decidua vera showing greatly expanded vessels and hæmorrhage. To the right the muscular wall beset with small hæmorrhages. (It is therefore a case of "diffuse utero-placental apoplexy.")

It is evident, from a study of these changes, that the vascular disturbances present in accidental hæmorrhage are widespread, and in any attempt to account for them one must recognize that they are found throughout the uterus, and are not confined to the placental region. It has been amply proven that a toxæmic state cannot be considered as an ætiological factor, for in 50 per cent., if not more, there is no albuminuria. In discussing the causation of the milder degrees of retroplacental bleeding it was pointed out that a blockage in the veins of the decidua or adjacent muscle might quite well explain the condition. As a matter of fact, this explanation has been advanced by Veit to account for accidental hæmorrhage, his belief being that a mass of deported villi may plug the vein. In my belief this is an unlikely explanation, for it is difficult to see how a mass of villi sufficiently large could be severed from the placenta, though from Veit's sections which I have had the opportunity of examining, it is evident that there may occur a very luxuriant growth of villi along the veins adjacent to the placenta. To my mind a thrombosis in the veins is a more likely explanation. It is well known that thrombosis of the veins of the decidua and uterine muscle is so common that it may be looked upon as a normal change in the later weeks. It is also known that during pregnancy there is a very special tendency to the excessive formation of thrombi in the veins throughout the body. A blockage of the small veins near the placenta may quite well account for the smaller degrees of hæmorrhage in the retroplacental site. For the vascular changes present throughout the uterus in cases of accidental hæmorrhage are so widespread that it is evident that, if blockage of the veins is the cause, it must be a blockage that is far back in one of the main venous trunks in the uterus or even in the broad ligament.

As I have said, I had only one specimen in which a complete examination of the changes was possible. In it I decided to investigate the main ovarian and uterine branches, and, to my surprise, without the least difficulty a massive, extensive, and fairly old-standing thrombosis was found in the ovarian vessels on each side, especially in the left. The uterine vessels seemed to be healthy. *It is therefore probable that accidental hæmorrhage is due to a thrombosis in a main venous trunk in the uterine wall, or even in the pelvis. The thrombosis probably occurs slowly, and may be present without any untoward signs, so long as it is not sufficient to obstruct the lumen of the vein completely. Let the obstruction become complete, especially let this occur suddenly, and the great venous pressure thrown back throughout the affected regions of the uterus will at once lead to the changes described.*

The main purpose of this investigation was not a discussion of the ætiology of placental infarction, or even of the ætiology of accidental hæmorrhage. I have devoted considerable space to their consideration, because I believe that the usual interpretation which is placed upon them has blocked the way for an enlightened effort to fathom the exact relationship existing between the toxæmic states (albuminuria and eclampsia) and placental disease. Hitherto this relationship has been considered as, in many respects, a mystery. This attitude, as I have tried to show, was due solely to the failure to recognize that placental disease must be considered as due to a cutting off of the maternal blood supply. *Whatever be the cause of the vascular interference, it is certainly not due to a toxæmic state. The study of the anatomy of placental infarction showed this, and the investigation of the conditions present in accidental hæmorrhage have proved it. It is clear, then, that if placental disease is especially prone to exhibit itself in association with a toxæmic state, and if it can be shown to be neither due to this toxæmic state nor to any condition accompanying this toxæmic state, the only solution of the riddle is that the necrotic placenta is the source of the poison.*

There is no method of evading this conclusion. I pointed out early in this research that the clinical evidence in ordinary cases of albuminuria and eclampsia, taken in conjunction with the anatomical, strongly suggested that this was the true explanation of the relationship. An exactly parallel study carried out in regard to accidental hæmorrhage leads to the same conclusion.

EXPERIMENTAL REPRODUCTION OF ECLAMPSIA IN LOWER ANIMALS.

The anatomical investigations recorded in the preceding pages indicated that the poison or poisons responsible for albuminuria and eclampsia are elaborated in a dying placenta. They, moreover, led to so precise a knowledge of the exact manner in which this process occurred that it seemed likely that an imitation of it *in vitro* should enable us to isolate the toxic material for experimental purposes.

One fact issued clearly from these investigations—namely, that the poison must be elaborated early in the course of the disintegrative change of the placenta; for there may be a fulminant toxæmia with an apparently healthy placenta. In severe toxæmias, however, if several days elapse before the birth of the placenta, massive, recently necrotic areas are visible. The time during which the placenta has been retained has allowed of the evolution of the devitalized patches into visible dark red or purple nodules of solidified tissue. In my earlier experiments this fact was not grasped. The placenta was autolysed for eight days or longer, and, although a suggestion of success was every now and then obtained, the results were, on the whole, disappointing. With a clearer understanding of the exact process the results were positive all along the line. To begin with, a definite standard, by which the results were to be gauged, was formulated. Such a standard was not difficult to obtain, as the clinical and morbid picture in eclampsia is so precise. An attempt was to be made to reproduce this in lower animals in its totality. The main objects to be aimed at were: (1) The production of severe convulsions; (2) the reproduction of the liver changes, which, it is well known, are especially characteristic of eclampsia; and (3) the reproduction of the degenerative changes in the kidney.

Convulsions.—This, the main symptom in eclampsia, I had expected, when beginning my experiments, to find developing only some time after the animal had been brought under the influence of the extract of the autolysed placenta; for it has been usually believed that the convulsive seizures are due to the accumulation in the system of some product of faulty metabolism, and are secondary to the liver or kidney involvement. When the proper method of preparing the placenta was discovered, one of the most immediate results of the injection (sometimes developing within twenty or thirty seconds) were severe and prolonged muscular spasms. In many cases the condition was an accurate reproduction of an eclamptic seizure.

Liver Changes.—These are so characteristic, as found in eclampsia, that I decided to make them the chief touchstone by which to test my results. Workers who have specially devoted their attention to these changes almost unanimously testify to their special association with eclampsia. They consist in a diffuse involvement of the organ. On naked-eye examination whitish areas are found scattered irregularly throughout its substance. In most cases small, they may in unusual cases form large white patches. Microscopically, they are seen to consist of "focal necrosis," which, in the case of the younger and smaller patches, are especially distributed towards the periphery of the lobules. In addition, there is thrombosis in the vessels, especially towards the periphery of the lobules, and, in many cases, there are scattered hæmorrhages. So characteristic are these changes that Konstantinowitsch says that a diagnosis can be made from an examination of the liver alone. The specially characteristic feature is the localization of the early changes to the outer parts of the lobules. In this respect, also, my results have been positive. The subcutaneous injection of extracts made from autolysed placenta have given liver changes identical in every respect to those just referred to. I have been able to reproduce the focal necrosis, in the earlier stages especially, located in the periphery of the lobules (figs. 11 and 12). In other cases, large, sprawling masses of necrosis have been found, and, in one animal, necrosis of a great part of one lobe of the liver was produced. Moreover, thrombosis in the vessels at the lobule periphery would seem to be the cause of the necrotic changes. Throughout the liver in these cases a diffuse fatty degeneration of liver cells is often present, as also scattered areas of hæmorrhage.

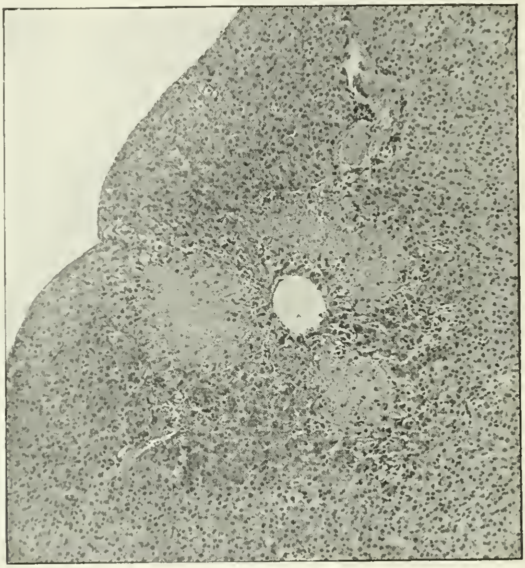

Fig. 11.

Liver of guinea-pig injected subcutaneously with extract of autolysed human placenta. Shows "focal necrosis" similar to that found in the human liver in eclampsia.

Kidneys.—The changes in the kidney, though usually found in eclampsia, are neither so consistent nor so characteristic as the liver changes. In many cases they are slight. In marked cases there may be patches of necrosis scattered throughout the organ. The part specially affected is the epithelium of the convoluted tubules, which shows a cloudy swelling, a fatty degeneration, or coagulation necrosis (Schmorl). In my experiments I have been able to reproduce these changes exactly, and it is especially important to note that the special region, which the toxic material that I have isolated affects, is the epithelium of the convoluted tubules (fig. 13).

Technique and General Method of Experiments.

The animals used were almost entirely guinea-pigs, and number forty-seven in all. For the extract fresh normal human placentæ were used.

Method of Preparation of Placenta.

To begin with, this caused considerable anxiety and trouble. As I soon discovered, it is well-nigh impossible to obtain a placenta in an absolutely sterile state. Some method had, therefore, to be discovered of preventing the growth of organisms, whilst allowing the natural ferments of the placenta to act. I first used thymol, adding a small piece of this to the saline solution in which the placenta was immersed. This method I employed when I was allowing the autolysis to continue for seven or eight days. I invariably found that there was

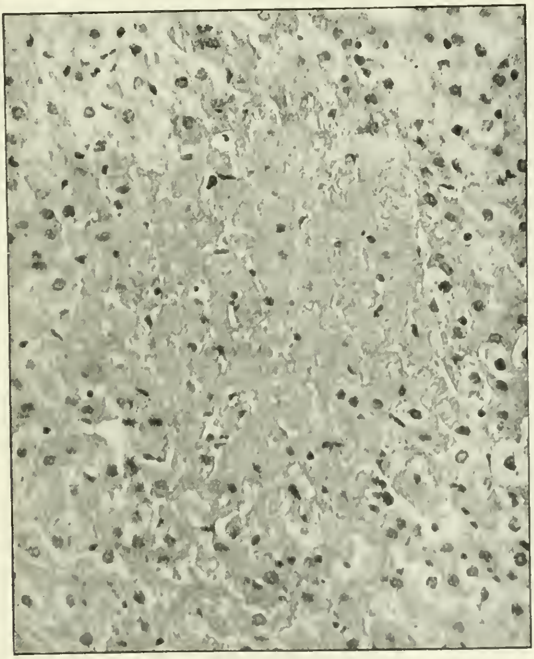

FIG. 12

Liver of guinea-pig injected subcutaneously with extract of autolysed human placenta. Focal necrotic patch similar to that found in eclampsia.

a copious development of *Staphylococcus albus* by that time. I next turned my attention to chloroform. This is admirable as an antiseptic, but I suspect that it must inhibit the action of the ferments. In some cases, however, I got a suggestion of positive results with this method. After the autolysis was completed the chloroform was extracted by evaporation *in vacuo*, and the juices were extracted by means of Büchner's press. The methods which I am at present using are three in number:—

(1) Once it was recognized that only a short period of autolysis was required it was thought that, by drying small pieces of placenta in the incubator, the drying process, whilst allowing a short autolysis, would take place so quickly that the risk of infection would be so meagre that it need not be allowed to enter into one's calculations. For this reason small pieces of placenta are washed freely in sterile water, spread out flat on sterile dishes, and placed in the incubator. In twelve or sixteen hours they are quite dry and can be powdered in a sterile mortar. The fibrous structure that remains at the end unpowdered can be easily removed by straining the whole through a fine wire sieve, previously passed through the flame. In this way we obtain a reddish-brown, fine powder that can be injected subcutaneously, suspended in saline solution.

(2) As the results obtained with this powder were so strikingly positive, it was decided to employ some other method of autolysing the placenta, which would not be open to even the shred of suspicion, so far as infection is concerned, to which this powder may be held liable. For this reason pieces of placenta, about $\frac{1}{2}$ in. square, were washed free of blood as before, and placed in glycerine and incubated in it. When ready, two or three pieces are placed in a sterile mortar and pounded with 10 c.c. of saline solution.

(3) Recently I have been placing the placenta in saline solution, on the surface of which a film of toluol is placed. The proportions by weight of placenta to saline are two to one. If the whole is thoroughly shaken up before being placed in the incubator, enough of the toluol remains in solution to prevent any organismal growth. This method I began to use when it became apparent that the toxic material or materials liberated by the autolysing placenta were extremely soluble. It was thought that by simply employing the supernatant solution into which the toxic substance had dissolved the same results should be obtainable.

Record of Experiments.

There are several points which require further investigation before a complete publication is possible. For example, I have obtained evidence, during the course of my work, that there are two distinct chemical substances responsible for the eclamptic attack. With the employment of the dry powder marked convulsive seizures are usually obtained, as also the liver changes. With the employment of the glycerine extract, whilst muscular spasms are often present, there are never convulsions, though the liver and kidney changes are obtained in a marked degree. These facts suggest that whilst the powder contains both of the toxic substances the glycerine extract contains chiefly that which has a special tendency to produce thrombosis. For these reasons I will record only those aspects of the results which are more or less final in their demonstration, and which are necessary to substantiate the belief that we have isolated the toxic material responsible for eclampsia.

Control Experiments.—A rigorous control was carried out. For this purpose twenty guinea-pigs (which were injected, sometimes over a long period, with extracts of the ovary or corpus luteum) were employed. These experiments were carried on coincidently with mine, and the animals were obtained from the same stock. For the opportunity of examining these control animals I am indebted to Dr. A. C. McMaster. In every case the liver and kidneys were examined. In none of them were convulsions, or other immediate signs of poisoning, ever produced. This disposed of the possibility that the spasms obtained in my experiments were merely due to the injection of foreign proteid, &c. In none of the controls were the liver and kidney changes discovered which are characteristic of eclampsia, and which I obtained with the placental injection. I think the absence of the typical liver lesions in such a large number of control animals may be considered as convincing proof of their specificity as found in my experiments.

Details of Experiments.

The injections were invariably made subcutaneously into the loose tissues of the back. By employing this method one had in view the avoidance of a rapidly fatal result, such as is apt to happen with intravenous injection. As other experimenters have shown (Weichardt, Pilz, Freund, &c.), the intravenous introduction of placental extract is quickly followed by death, due to a widespread intravascular thrombosis. Even though the right toxic substance had been isolated in their experiments, a proper test of its effect, as regards the morbid changes produced, was rendered impossible. Another objection, that of Lichtenstein, was overcome by the subcutaneous method of injection. This worker has shown that the intravenous injection of mineral matter in small particles—e.g., sand—may cause results exactly similar to those obtained by Weichardt, Pilz, and Freund, and he believes that these were due, not to any toxic action on the part of the placenta, but merely to the introduction of free cellular elements into the circulation.

Injection of Fresh Placental Extract.—Five animals were injected with the juice expressed from the placenta by means of Büchner's press. This is definitely toxic, if employed in large quantities, doubtless due to the action of a foreign proteid. In two animals 2 c.c., 3 c.c., and 10 c.c. were injected respectively on three successive days. The last dose killed within twelve hours. Three animals were injected with 10 c.c. of this extract at one time and two lived. In none were convulsions produced, and, in those that died, no specific liver or kidney changes were observed.

Extract of Placenta autolysed for Seven to Nine Days in Chloroform.—Thirteen animals were used: 5 to 8 c.c. of the extracted juice were injected once or twice daily till the animals died. In some this occurred after three to four injections, in others not till twelve or fourteen had been given. In one definite and marked convulsions were obtained; in most of the others general muscular spasms. Immediately after the injection the animals always became stupid and dull within a few minutes. In none were the liver and kidney changes produced.

Placental Powder.—It was the use of this that gave the first definitely positive results. Fifteen animals employed: 0·4 or 0·5 grm. of the powder was suspended in 6 or 8 c.c. of saline solution, and injected subcutaneously, usually night and morning. Three or four injections are sufficient to kill. In twelve, convulsive seizures were produced, varying from extremely marked tonic and clonic spasms of the whole body, lasting from ten minutes to an hour or longer, to general twitchings of the muscles of the head, trunk, and limbs. Other immediate signs of a toxic action were giddiness and a tendency to fall to the side, drowsiness with, in many cases, a complete absence of response on touching the eyes. To anyone acquainted with guinea-pigs these signs will at once assume suggestive proportions. In all, *degenerative lesions in the liver* were obtained, in six typical focal peripheral necrosis, whilst in two large, irregular sprawling masses of necrotic liver tissue were found. These appearances are shown in figs. 11 and 12. Degenerative lesions in the kidney, especially involving the convoluted tubules, were found, but these were neither so evident nor so constant as the liver changes (fig. 13).

Saline Solution in which Placenta was autolysed for varying Short Periods of Time.—Six animals were used for this. Quantities varying from 5 to 10 c.c. of the supernatant fluid were removed after periods of autolysis varying from one and a half hours to sixty hours. These experiments were primarily carried out for the purpose of determining whether the toxic material passed readily into solution. For this purpose the presence of convulsive spasms was taken as a test. The results in this respect were positive, and showed that even as short a period of autolysis as one and a half hours was sufficient to liberate, at any rate, the element that provokes convulsions. The spasms are short-lived. Whereas, with the powder, the spasms may last for twenty

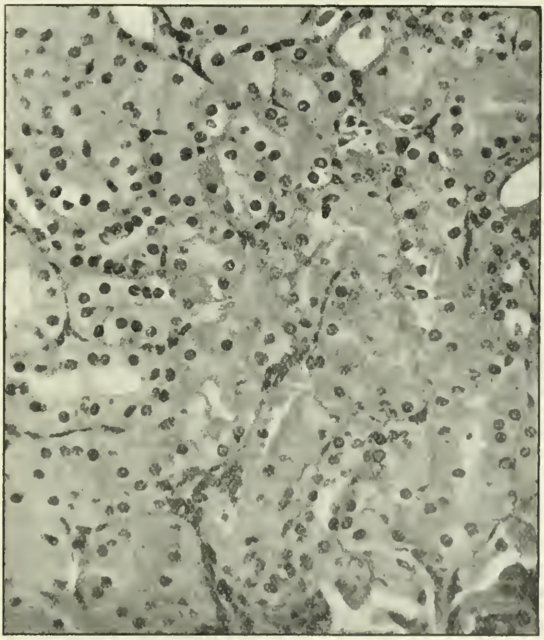

FIG. 13.

Kidney of guinea-pig injected subcutaneously with extract of autolysed human placenta. Convoluted tubules showing evident degenerative changes.

minutes or longer, with this solution, even in markedly posiive cases, the spasms rarely last for more than twenty or thirty seconds. So far, an investigation into the liver and kidney changes in such cases has not been carried out.

Placenta autolysed for Short Periods in Glycerine.—Eight animals were employed. The autolysis was allowed to continue for periods varying from ten to thirty-six hours. It soon became evident that the extract thus prepared is extremely toxic. Almost immediately after the injection, even of the extract of the short autolysis, the animals become dull and stupid, and often giddy. There may be general muscular spasms, but this is rare, a fact which shows that the specially toxic ingredient must differ from that present in the dried placental powder. Whereas with the powder the animals usually have recovered to a very large extent six or eight hours after the first dose, with this extract they never regain their usual vitality and remain till the end in a toxic state.

In this connexion it is interesting to note that the necrotic changes in the liver and kidney are especially marked with the glycerine extract. They were obtained in all the animals. In one animal the greater part of one lobe of the liver was found necrotic at the post-mortem examination. The presence of well-marked kidney changes is important, in so far as they were not specially developed in the animals injected with placental powder. It is well known that, in eclampsia, the severity of the kidney lesions varies greatly in different cases. Even in fulminant cases they may be slightly marked. These considerations suggest that there are two different toxic agents operating in eclampsia and albuminuria, and that the exact clinical picture, presented in an individual case, depends upon the relative proportions of these two materials present. The one material has a special affinity for the cerebrospinal tissues, and may be called the convulsive agent. The other has a special tendency to produce necrosis in liver and degeneration in kidney, perhaps, as has been suggested by many workers, because of a hæmagglutinative element.

Clinically, it is known that there are two different types of eclampsia. In one the chief symptom is convulsions, though it is usually associated with specially marked liver lesions and often presents kidney changes. In the other, there may be no convulsions. In these cases there would seem to be a special tendency for severe necrotic changes to occur in the liver and, especially, in the kidney. Under the latter category would come these cases of "symmetrical necrosis of the cortex of the kidneys," which Jardine, Teacher, and Kennedy, of Glasgow, and others have reported. These two different clinical types would correspond to the two different toxic bodies liberated by a dying placenta.

GENERAL SUMMARY.

That eclampsia and the albuminuria of pregnancy are due to the liberation of the products of early autolysis of the placenta has been established by the following considerations:—

(1) The toxæmias are especially associated with recent infarction of the placenta. In severe cases, ending rapidly in labour, there may be no evidence, visible to the naked eye, of placental disease. If, however, the placenta is born several days after the attack, massive necrosis, obviously of recent origin, is seen. It requires some time for the necrosis to evolve into visible form.

(2) Placental infarction is due to an interference with the maternal blood supply of the part. It can be shown conclusively that the chorionic elements are dependent, immediately and directly, upon the maternal blood supply, and, so long as this is retained, can live, even when there is no fœtal supply.

(3) The interference with the blood supply, which is responsible for the infarction, is not dependent upon a toxic state and, in point of fact, may occur in the most extreme form, where there is no evidence of a toxæmia—e.g., accidental hæmorrhage. An examination of the placenta, wherever there is definite evidence of an involvement of the maternal supply, invariably shows disease corresponding exactly to the area of this involvement. This disease will be evident to the naked eye unless the involvement is quite recent. The study of accidental hæmorrhage was shown to be specially important in this connexion.

(4) The placenta is so constructed that, if a part of it die, the products liberated from the dying patch can pass directly into the blood-stream. The organ is unique in this respect. It thus arises that for the occurrence of a toxæmia a circulation of blood round the poison-generating foci is necessary. An understanding of this fact at once dispels many of the difficulties associated with this study. It explains, for example, the cessation of symptoms after the death of the child (and separation of the placenta), and it explains the absence of a toxæmia in cases of accidental hæmorrhage (50 per cent. of the whole) in which the placenta is completely detached by the blood-clot, or by other means. The cases of accidental hæmorrhage associated with a

toxæmia are those in which part of the placenta remains attached for some time after the separation of the adjacent part by a retroplacental bleeding. The necrosis of this part liberates the toxic materials.

(5) Where the placental disease is gradual in its onset there is more chance of the evolution of the infarcted patches. This explains why, in long-standing albuminurias, there may be more visible placental disease than in an acute eclampsia. It is just the gradual development of the toxæmia that allows of the pregnancy continuing.

(6) These facts all suggest that the toxæmias are due to the autolytic products liberated in the early stages of the placental death. By imitating the process, which occurs *in utero*, it has been possible to isolate from the healthy placenta a material or materials of a soluble kind which reproduce the clinical features and morbid changes, which all agree are especially characteristic of eclampsia. These are (*a*) convulsions, (*b*) peripheral focal necrosis in the liver, and (*c*) degenerative lesions in the kidney, especially located in the convoluted tubules.

In conclusion, I would say that, whilst *post-partum* eclampsia constitutes the only difficulty which I know of in the way of absolute proof of my thesis, I think the evidence I have advanced is sufficiently cogent to necessitate a thorough exploration of the uterus in all such cases for a small piece of retained placenta; for a comparatively small piece may suffice to liberate fatal poisons.

I have to thank Sir Halliday Croom and Dr. Haultain for their kindness in allowing me to obtain the specimens of placenta from the Maternity Hospital during their period of office there.

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DISCUSSION.

The PRESIDENT (Dr. W. S. A. Griffith) said that all members of the Section would recognize the importance of Dr. Young's views on the ætiology of eclampsia if they were established by further investigation. If his theory as to the cause could not apply to every case it might be correct for a group, but it was difficult to see how it could apply to cases occurring after delivery was completed. If it were shown that in all the delayed cases a portion of the placenta was retained it would be necessary to explain how it was that in common cases where retention of portions of the placenta occurred (sometimes large portions, of which the President gave an instance) no symptoms of toxæmia developed. Dr. Young submitted his views and invited thorough criticism. The President hoped that so important a subject, so ably investigated, would receive this criticism from the members of the Section.

Dr. OLIPHANT NICHOLSON had listened to Dr. Young's paper with great interest. It was generally agreed, he thought, that eclampsia was caused by a toxin circulating in the blood-stream, and many things pointed to the placenta being intimately concerned, directly or indirectly, with the elaboration of the toxin. The toxin of the eclampsia acted on the circulation like adrenalin, and caused a great rise in blood-pressure, due to its intense and widespread action in contracting the arteries and arterioles. The cutting off of the arterial blood supply to kidneys, liver and lungs produced great venous congestion in these organs; as regards the kidney, the main clinical symptom of the disease—suppression of urine—was thus brought about; while in the lungs great œdema might occur. Clinically, in impending eclampsia, the circulatory features could not fail to attract attention. When Dixon and Taylor, in 1907,[1] asserted that human placental juice contained a substance which contracted the arterioles, and raised the blood-pressure even more strikingly than adrenalin, one began to think that the source of the eclamptic poison had been discovered. In 1909, however, Rosenstein stated that *fresh* human placenta did not contain any blood-pressure-raising principle, and that the autolytic enzymes of the placenta could not produce pressor substances without the help of micro-organisms. So it seemed to be settled, once and for all, that the pressor substance described by Dixon and Taylor was really the result of initial putrefaction in the placenta. Now Dr. Young seems disposed to think that this conclusion has been too hastily accepted. He has isolated a substance from the placenta which is capable of causing, in animals, not only violent convulsions, but also changes in the liver quite similar to those found in eclampsia. In *dead* placenta, as in putrid meat, a powerful pressor substance is formed—very like adrenalin in its chemical formula. Was Dr. Young's toxin similar to this? It was interesting to recall that some eleven years ago H. Müller and W. Albert wrote papers in which they hinted that the toxin of eclampsia was the product of putrefactive changes occurring within the uterine cavity. They regarded eclampsia as an intoxication which was caused by the action of bacteria within the decidua —a latent microbic endometritis. The association of high temperature with many cases of eclampsia might suggest this kind of origin, and *post-partum* eclampsia would be more easily explained. In their view the toxin originated from death and putrefaction occurring in part of the uterine contents, and the Dixon and Taylor vaso-constrictor was elaborated in a similar manner. So was Dr. Young's toxin, in his opinion, and it might really be the toxin of eclampsia. But some vaso-constricting substance was certainly present in the blood at the very commencement of pregnancy, and long before any autolytic changes in the placenta would be likely to occur. Clinically, the changes in the maternal heart and circulation in pregnancy—dilatation of the right side of the heart, tendency to œdema of the lungs, overfilling of the veins of the legs, and venous pulsation in the neck—pointed most conclusively to the presence in the blood of some principle which caused constriction of the arterioles. It seemed impossible to admit that some autolysis of the placenta occurred in every pregnancy as a matter of course, and it was more in accordance with physiological reasoning to regard the placenta as a new metabolic gland, temporarily grafted into the maternal organism, and producing a more or less profound hormonal upheaval. It was this metabolic upset which, in his view, was responsible for the appearance in the blood of a vaso-constricting substance as soon as gestation commenced. That constituted the so-called "toxæmia of pregnancy," and it might be trifling or exceedingly grave, according, he believed, to the personal factor present. When this toxæmia steadily advanced, the arterial blood supply to the various glandular organs was so greatly shut off that portions *did* sometimes undergo necrosis. That actually did happen in the case of the kidney and liver, and why should not portions of the placenta die too, and undergo autolysis? Then the manufacture of a toxic pressor substance, such as Dixon and Taylor had described, or such as Dr. Young had isolated, would be explained—a substance capable of causing convulsions and coma. It would be interesting and important to get the opinion of a competent chemist on the nature of the toxic body which Dr. Young had separated from the necrosed areas of placenta—whether or not it was the result of putrefactive changes and allied, perhaps, to tyramine. He thought that Dr. Young had shed an instructive side-light on the most fascinating and puzzling riddle in obstetric medicine.

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[1] *Proceedings*, 1908, i, p. 11.

Dr. McMaster referred to work he had been doing recently that involved the injecting subcutaneously of emulsions of animal tissues and of watery extracts of animal tissues. In some instances the emulsions had become infected, and had caused the death of the animals injected. The livers of these animals had been examined, and in no cases had changes similar to those Dr. Young had shown been produced. A fatty degeneration had been found, and evidence of degenerative changes in liver cells, also scattered inflammatory foci, but in no instance had necrosis been observed. He found that guinea-pigs always twitched after subcutaneous injections, probably as a result of the pain caused, but in the case of Dr. Young's animals the twitchings were much more violent than in his own cases and amounted to fits: the animals became stupid, and lost their conjunctival reflex.

Dr. T. W. Eden said that he wished to congratulate Dr. Young on the elaborate piece of work he had done, which, he felt sure, had interested the Section very much. If he might select one or two points for criticism he would refer, in the first place, to the view expressed by Dr. Young that red and white infarcts were stages of the same process. He (Dr. Eden) had been interested in the subject of placental infarcts, and the observations which he made some years ago led him to the conclusion that the primary change in white infarcts was an obliterative endarteritis of the chorionic vessels. He hoped Dr. Young would publish the histological evidence in support of the view he had advanced that night. With regard to Dr. Young's main thesis, it appeared to him to prove too much. If the detachment of a placental cotyledon by accidental hæmorrhage a day or two before labour was all that was required to produce an acute toxæmia, that condition might be expected to be very common instead of very rare. Cases of accidental hæmorrhage of placenta prævia were comparatively frequent, but were very rarely accompanied by toxæmic conditions comparable to eclampsia. Further, the process of formation of a blood mole ought, on Dr. Young's hypothesis, to lead to acute toxæmia, but we learn that this was certainly not the case.

Dr. James Young thanked the Section for the way in which they had received his paper, and for the kindly and helpful criticism they had offered. Dr. Griffith made the most serious objection to any placental explanation of eclampsia when he asked how *post-partum* eclampsia was to be accounted for. There could be no doubt that the origin of the poison was the child or placenta, therefore in such cases there must be something left behind. The retention of pieces of placenta was a common thing, whereas eclampsia was comparatively rare. Such a piece remained attached, doubtless, because at that region the placenta was especially adherent, a fact that explained why one often found after curettage, carried out some time after for hæmorrhage, that the villi had remained well nourished. The vascular attachment had remained good. Even a small part dying might account for a severe *post-partum* toxæmia. Then as regards the absence of a toxæmia in cases where the fœtus and placenta were delivered in a stinking state, Dr. Young had seen such cases. The remarkable thing was there was not the slightest rise in temperature, though the staphylococcus was obtained. The only explanation of such a fact was that soon after the detachment of the placenta the blocking of the vessels by thrombosis prevented absorption of the infective products. The same explanation, doubtless, accounted for the absence of eclampsia in similar cases. Eclampsia had been reported in such cases, and was quite explained by an incomplete placental separation. It was well recognized that a toxæmia often ceased immediately with intra-uterine death, whereas in other cases it did not. These facts meant only one thing, that where placental separation was complete absorption was prevented, but it continued where a part remained attached. Dr. Williamson said that convulsions were produced by many things in animals. Surely Dr. Williamson must be thinking of twitchings, which were common with any foreign matter. In his controls Dr. Young had never found true convulsions. Glycerine had been used in one of the methods of preparing the extract, but the results completely discounted what Dr. Williamson said, because, with this extract, convulsions were not obtained. The importance of this finding was referred to in the paper. Then Dr. Williamson enumerated a list of materials that can cause liver changes exactly similar to those found in eclampsia. A careful study of the literature showed that these changes were found only rarely, if ever, in other conditions. In the experiments the only possible causes of the liver changes were, firstly, sepsis; secondly, foreign animal matter; and, finally, a material specifically obtained in the way the placenta was prepared. Sepsis was excluded by cultural tests and by the controls; foreign proteid was excluded by the controls, leaving the only interpretation that which had been advanced. Dr. Young thanked Dr. Oliphant Nicholson and Dr. McMaster for coming from Edinburgh to take part in the discussion. The latter he thanked especially for permission to mention his experiments as controls. Dr. Eden asked if eclamptic placenta was used. The answer was in the negative, because the demonstration of positive results with it might, by some, be held to mean simply that some of the toxin was held up in the placenta without being elaborated there. In answer to another question, Dr. Young said that it was easy to show that the red and white infarcts were merely different stages in the same process. There were all grades between them, the white was more necrotic, and the hæmoglobin was dissolved out by the autolytic process.

Obstetrical and Gynæcological Section.

June 11, 1914.

Dr. W. S. A. Griffith, President of the Section, in the Chair.

Thoracopagus approaching to Prozygosis (Prosopo-thoracopagus).

By H. Macnaughton-Jones, M.D.

Dr. Macnaughton-Jones said that the twins shown were sent to him by a medical friend in South America. The mother was aged 36, of Spanish origin, and the father a German-Brazilian. This was the seventh pregnancy.

Mr. Alban Doran had been kind enough to examine the specimen, and it could not have been placed in better hands. He classifies it as a Thoracopagus approaching to Prozygosis, and he would give his reasons for thus classifying it. The specimen was being added to his (Dr. Macnaughton-Jones's) collection in the Museum of the Royal College of Surgeons of Ireland, and was therefore not dissected, but he thought that the Fellows would like to see it first.

Report by Mr. Alban Doran.

This is a double monster—female twins, united above the umbilicus, and equally developed. The umbilical cord is single, depending from the fœtus, which is here mounted with the left ear forward.

The union extends unusually far "forwards" (that is, in human anatomy, upwards), involving not only the thoracic wall but also the neck, lower jaw, and lower lip. According to the classification adopted by Mr. B. Thompson Lowne in the Catalogue of the Teratological Series in the Museum of the Royal College of Surgeons, this monster is double, and of the sub-class Emprosthozygosis (Thoracodidymus, Gurlt).

The twins are united above the umbilicus face to face, and equally, or sub-equally, developed. That is to say, one is not reduced to an acardiac parasite, depending from a well-developed "autosite." The least marked form of this sub-class is Xiphopagus—union by the xiphoid cartilages of the sternum, and the abdominal walls above the umbilicus. This is the variety that sometimes survives birth and attains adult age, like the Siamese twins.

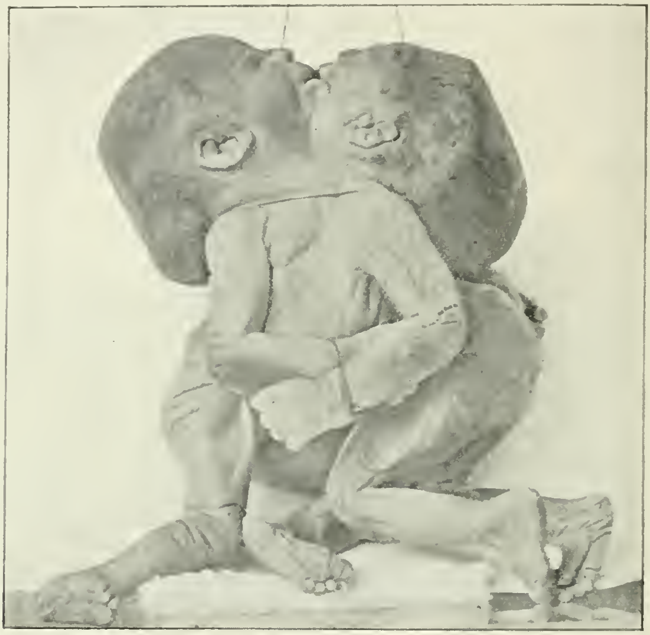

Fig. 1.

Photograph of twins.

The specimen here exhibited is an instance of the type Thoracopagus (Sternopagus, Geoffroy St. Hilaire) where the thoracic cavities are united by the visceral laminæ. The twins face each other in the usual manner.

It may be compared with No. 73 in the Museum of the Royal College of Surgeons, where the twins are united along the thorax only.

In this monster the union reaches the lower part of the face. The extension of the union allies it to the sub-class Prozygosis, which, according to B. T. Lowne, differs from Emprosthozygosis in the more complete union of the twins, which are united from the umbilicus to the vertex. In Prozygosis, typically developed, there are two perfectly distinct axes united at their "anterior" (*superior* in man) extremities. The fœtuses arising from such embryos are united by the visceral arches of laminæ above the umbilicus. The right side of one axis unites with the left side of the other.

The deformity is extreme, and the faces lie on opposite sides of the united head. This is seen in No. 103 in the Museum of the Royal College of Surgeons. The mother was a coloured woman. As in this specimen, there was a common umbilical cord. However, in the latter, here exhibited, the union of the faces, though complete at the lower jaw, is rudimentary, the faces being quite distinct above the lower lip.

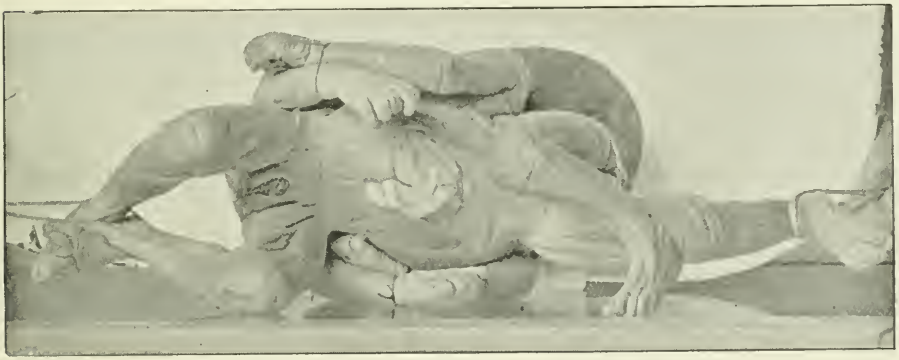

Fig. 2.

Umbilicus and inferior extremities.

Schwalbe ("Morphologie der Missbildungen des Menschen und der Tiere," II Theil: Die Doppelbildungen, p. 236), the most recent authority, calls this type Prosopothoracopagus, and admits that it is a true intermediate form, connecting Prozygosis (Cephalothoracopagus, according to Schwalbe's nomenclature) with Thoracopagus. Schwalbe finds that only three instances of Prosopothoracopagus in man have been reported. Barkow, Daude, and Otto each publish one of the three cases, and in Barkow's monster, which is figured in Schwalbe's work, the union of the twins involved the lower lip, as in the monster here exhibited. Mr. Alban Doran was interested to learn that Dr. Waterston agreed with Schwalbe in the theory that a monster of this type, "Prosopothoracopagus," was embryologically a transition form between Thoracopagus and Prozygosis, which meant that those two distinct types were similar in origin.

A Lithopædion removed from a Patient Six Months Pregnant.

By S. G. Luker, M.D.

The specimen consists of an extra-uterine fœtus covered by a bony shell, forming an ovoid tumour 6 cm. by 4·5 cm. by 3·2 cm. after hardening. It was removed from a married woman, aged 33, who was admitted to the London Hospital as an emergency case with a three weeks' history of pain localized and acute in the right groin, a lump in the right groin painful to touch, and swelling and pain in the right leg. She was about six and half months pregnant. She had been married twelve years, and had given birth to three stillborn children, the last four years previously. Three months after marriage she had suffered from a "complication of diseases" for two months; this was probably the ectopic gestation from which the lithopædion resulted. She had never been entirely free from pain in the right groin since that date, and had suffered from increased pain and noticed a lump in that region during each pregnancy.

On examination the pregnant uterus was found extending about 2 in. above the umbilicus; high up in the right iliac fossa was a tender lump with indefinite outline suggesting an intraperitoneal abscess, possibly appendicular in origin. Laparotomy was performed, and the swelling was found to consist of the lithopædion and the right Fallopian tube much dilated and thickened enclosed in a capsule of adhesions forming a mass the size of an orange. Abortion occurred three days after the operation, but convalescence was otherwise uninterrupted.

Description of the Specimen.—The specimen consists of an ovoid mass about 6 cm. long, covered with an elastic bony shell with a smooth shiny surface. The child is in a sitting position, with head bent forward and spine hunched, the face buried between the hands and knees. The left eye is clearly visible. The spine measures 4·5 cm., the right humerus 3 cm. The bony shell is in places 0·2 cm. thick.

The case was under the care of Mr. Frank Kidd, of the London Hospital, to whom I am indebted for leave to show this specimen.

A very Young Human Embryo found embedded in a "Decidual Cast" of the Uterus.

By DAVID WATERSTON, M.D.[1]

THE special interest attached to the specimen lies in the fact that a very young human embryo was found embedded in the wall of a decidual cast of the uterus, and that the sections and the models show an early stage of the embedding of the embryo and of the formation of the placenta from the chorionic villi and decidua. The embryo is almost precisely 3 mm. in length, and its age I estimate as about 3 weeks.

The clinical history has been already published by Professor B. P. Watson and Mr. Henry Wade—who obtained the specimen, and to whom I am indebted for the opportunity of examining and reconstructing the embryo and the annexa—in the *Journal of Obstetrics and Gynæcology of the British Empire*,[2] and only a few of the main facts need be mentioned here.

The cast was passed from the uterus ten days after a missed period by a woman who had had repeated abortions. It was found to represent the whole of the lining membrane of the uterus, and was hollow. Projecting into the lumen was a small, pea-like nodule, 8 mm. in diameter, and, on the supposition that this nodule might contain an early embryo, the nodule was removed, embedded, and cut in serial sections. The authors were rewarded by finding that their surmise was correct, and, by great good fortune, the sections cut the embryo transversely to its long axis. A wax plate reconstruction model of the embryo and of the adjacent zone of chorion and the decidua at 50 diameters magnification was prepared in my laboratory, and other reconstructions of the embryo were also made at a magnification of 200 diameters.

The form of the embryo and its yolk-sac and body-stalk and the adjacent portions of the chorion and decidua are brought out so clearly in the models that little description of them it necessary. The first model (fig. 1) represents the segment of the "pea-like nodule" in which the embryo lay. The smooth surface is the free surface which projected towards the uterine cavity—in other words, the uterine aspect of the decidua capsularis, which is seen to be thin and uniform in character. At its margin it passes into the decidua marginalis, and this in turn connects it with the decidua basalis. The surface remote from the observer is rough and shaggy, and is the aspect of the decidua which had separated from the uterine wall. The separation had taken place in the stratum spongiosum.

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[1] Professor of Anatomy, King's College, London.

[2] *Journ. Obstet. and Gynæc. Brit. Empire*, 1910, xvii, p. 103.

The histology of the decidua need not be described in detail beyond stating that the "decidual reaction" was well marked, and that the surface of the decidua next to the chorion showed the "Nitabuch fibrin stria," a fibrinous or possibly necrotic layer, produced apparently by the syncytial layer of the chorion. Within the complete decidual capsule lies the chorion. The chorionic vesicle filled the "implantation cavity" almost completely. It was studded with villi, which were very numerous indeed on the surface towards the decidua basalis, but few and scattered on the aspect in contact with the decidua capsularis.

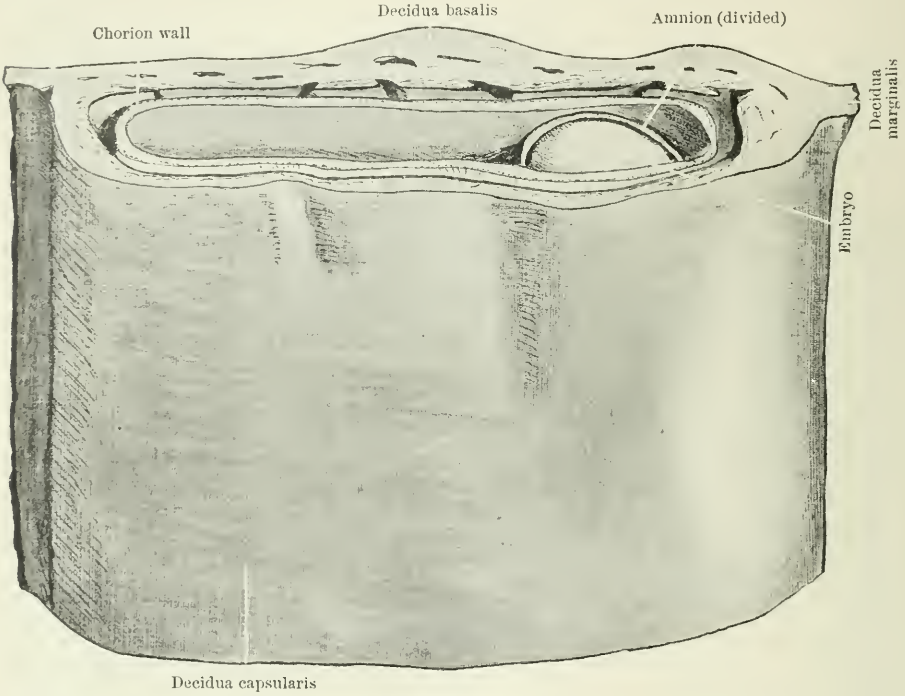


Fig. 1.

Reconstruction model of the portion of the decidua containing the embryo. Original model × 50. Reduced to one-third.

The second figure (fig. 2) shows the decidua capsularis removed, and the external surface of the chorion. The cavity of the chorionic vesicle contained not only the embryo, yolk-sac, and body-stalk, but the remainder of the cavity was filled with the "magma réticulée" of Eternod, a loose, fibrinous network, which is probably a precipitation deposit, and not organized (*see* fig. 4). The chorionic wall was already well vascularized by the branches of the umbilical vessels.

The next figure (fig. 3) shows the appearances seen after removal of a portion of the chorionic wall. The embryo is seen lying on its right side enclosed in the amnion, with a large yolk-sac ventrally, and the body-stalk passing from its trunk to the chorionic wall. The relation of these parts is well brought out by a transverse section at the level of the body-stalk, and the same section shows the blood-vessels of the embryo and the internal structure at this level (fig. 4).

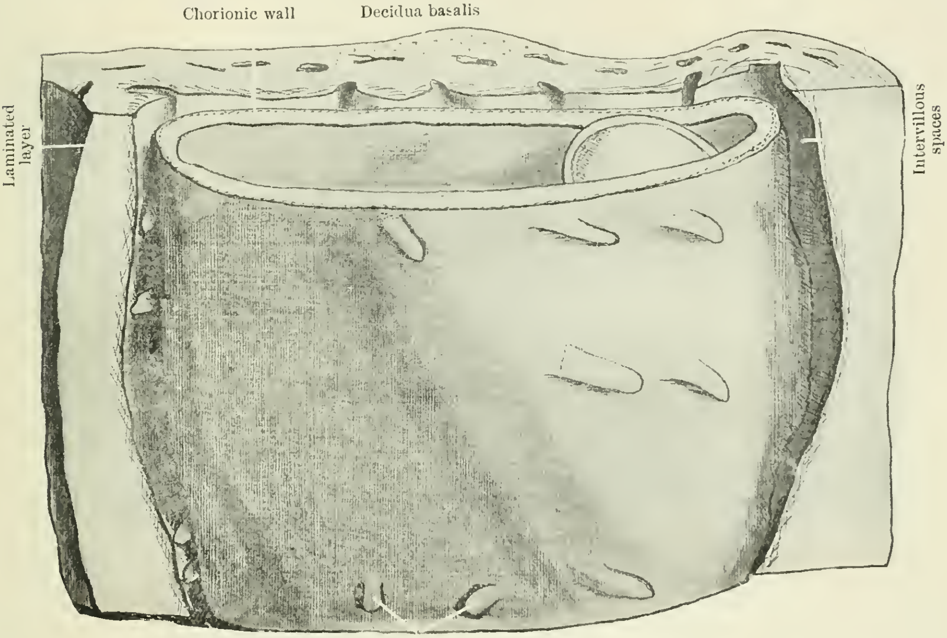


FIG. 2.

Same model, after removal of decidua capsularis.

The structure of the embryo I have worked out in detail, and the results will be published in the *Journal of Anatomy and Physiology* for October.

The principal results of my investigations, in so far as they bear upon the early implantation of the embryo, may be summed up as follows: At the third week the whole chorionic vesicle is embedded in the decidual lining of the uterus, and lies in a cavity which may be termed the implantation cavity. The layer of decidua which intervenes between this cavity and the lumen of the uterus is the decidua capsularis, while its floor is the decidua basalis. At this stage there is no sign of a "penetration aperture" or "Reichert's scar" in the decidua capsularis. The chorionic vesicle is freely covered with villi, and consists of an outer two-layered ectoderm wall, lined by mesoderm. The cavity of the chorionic vesicle contains a precipitation deposit or "magma réticulée." The embryo and yolk-sac lie in the chorionic cavity, and the body of the embryo is attached to the chorionic wall by a stalk of mesoderm—the "body-stalk"—in which lie the umbilical vessels passing between the embryo and the chorion. The yolk-sac is in continuity with the primitive alimentary canal of the embryo, and there is therefore a wide vitello-intestinal connexion, with the vitelline arteries and

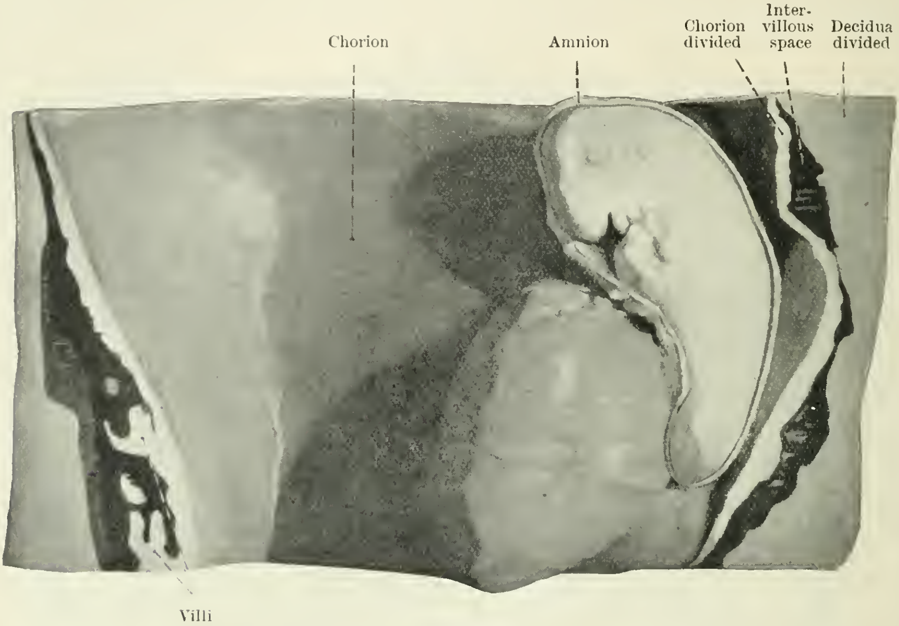


Fig. 3.

Appearances seen after removal of a portion of the chorionic wall.

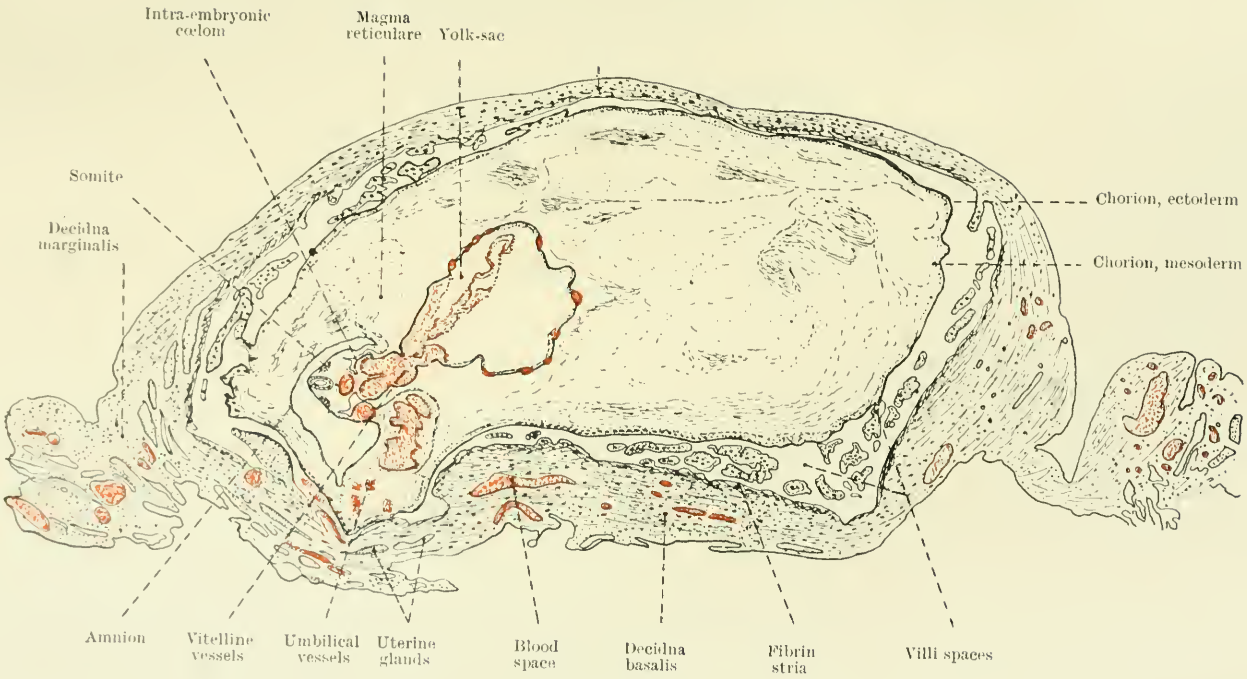


FIG. 4.

WATERSTON: A very Young Human Embryo found embedded in a "Decidual Cast" of the Uterus.

veins lying on each side and ramifying freely on the wall of the yolk-sac. The body wall of the embryo is continuous with the amnion round the margins of the wide umbilical orifice, through which pass the vitello-intestinal connexion and the vitelline vessels.

The PRESIDENT (Dr. W. S. A. Griffith) desired to thank Professor Waterston for his demonstration, and to congratulate him on the admirable models which he had with so much labour constructed. He also inquired if it would be practicable to have some reproductions made for demonstration purposes—they would be invaluable both to teachers and students. Dr. Griffith was sure that the appeal for material which Professor Waterston had made would be responded to by all who appreciated the value of the work he was engaged in.

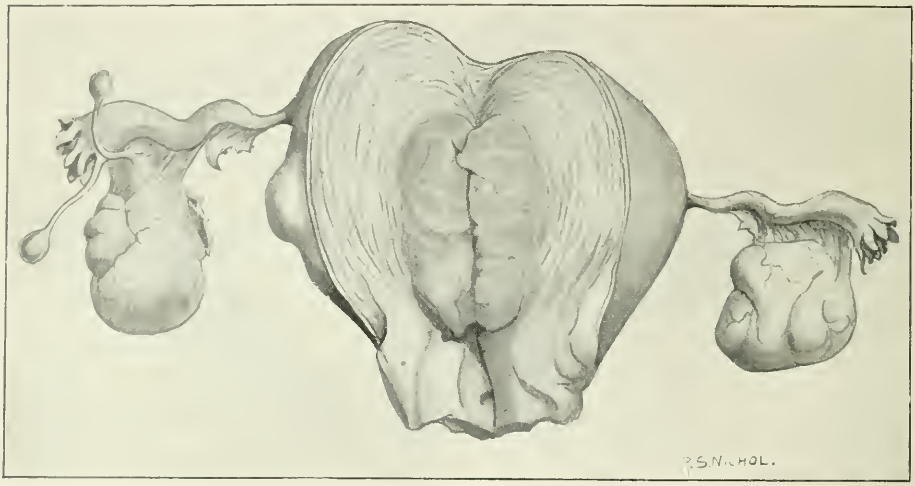
A Case of so-called Chronic Metritis in a Nullipara.

By ARCHIBALD DONALD, M.D.

THE patient was first sent to see me on March 19, 1912, by Dr. Floyd, of Gorton, Manchester. She was then aged 45, had been married four years, had never shown any signs of pregnancy, and was complaining of very profuse menorrhagia. She gave the following history: Her periods had always been profuse from the time they began at the age of 14; they had always lasted five to six days, and during the first three days the flow was always profuse, and for many years there had been discharge of clots. There was only a slight leucorrhœa after the periods. For many years after the onset of the periods she suffered from severe dysmenorrhœa. The pain was situated in the hypogastrium and left iliac region. It began after the flow was established, and lasted for the greater part of the first day. Of later years the dysmenorrhœa was not so marked a feature. Her chief trouble now is hæmorrhage. The periods now are not only profuse but long continued, lasting sometimes as long as three weeks.

On examination, the patient looked very anæmic; her lips and gums were very pale. She was stout and flabby. She complained of palpitation and her pulse was small, of low tension and irregular. The uterus was found to be distinctly enlarged, apparently about the size of a three months' pregnancy. From the history, the size of the uterus, and the absence of pregnancy, I diagnosed the case as one of fibroid of the uterus. I wrote to Dr. Floyd and asked him to keep her under observation, and stated that if she continued to suffer from profuse or continuous hæmorrhage, in my opinion a hysterectomy would be advisable. This opinion was arrived at mainly from the condition of the heart.

I did not see her again until May, 1913, when, at Dr. Floyd's request, I admitted her into my ward in the Manchester Royal Infirmary. The local conditions seemed unchanged, but the patient's general condition was certainly worse. The anæmia was very pronounced and the heart's action still irregular. The periods had been rather more profuse and prolonged than when I last saw her. I still regarded the case as one of fibroid of the uterus, and now advised removal of the uterus. This was done on May 30 by abdominal hysterectomy. There was nothing in the operation calling for remark, and the patient made a good recovery.



A uterus removed for general hypertrophy, or so-called chronic metritis, in a nullipara (note the great thickness of the endometrium).

Dr. W. Fletcher Shaw was good enough to take charge of the tumour, and he has sent me the following report on its naked-eye and microscopic appearances: "The specimen consists of a uterus, with both appendages attached, removed by supravaginal hysterectomy. The uterus is regularly enlarged and its walls very firm; without the cervix the length is 3½ in., and the walls are 1 in. to 1⅛ in. in thickness. The most marked feature of the specimen is the great thickness of the endometrium—a little over $\frac{1}{2}$ in. Microscopically, the uterine wall is seen to consist of muscular and fibrous tissue in the same proportion as in a virgin uterus. The blood-vessels are not enlarged and there is no elastic tissue to be found in the specimen other than the internal elastic layer of the blood-vessels and a few fine fibres amongst the muscle bundles in the outer third of the wall. Except for its great thickness the uterine wall is indistinguishable from a virgin uterus. The endometrium is enormously thickened. Many of the glands are much enlarged, but there are many patches where the glands are little, if any, enlarged. The interglandular tissue is of average density; a few patches are œdematous, but these are the exception. The blood-vessels are enlarged and numerous."

I have brought this specimen before this Section, as I believe it sheds some light on the ætiology of a somewhat obscure condition—the so-called chronic metritis in virgins—which is merely a general hypertrophy of the uterus found in women who have never been pregnant and in which, therefore, subinvolution is out of the question. Ten years ago I published a paper on chronic endometritis and chronic metritis in virgins. At that time my conclusions were based only on the scrapings of endometrium obtained by curetting and by clinical observation. I stated then that in my opinion the hypertrophy of the mesometrium was in the nature of a "work hypertrophy," and was caused by some abnormal condition (probably hypertrophy) of the endometrium. Since then I have had frequent opportunities of examining uteri removed for chronic metritis, and in a large number of them the endometrium has been markedly thickened. None of the cases, however, have shown the enormous hypertrophy which exists in this case, but as Dr. Shaw's report shows, the enlargement is a pure hypertrophy and not due to any disease. The reason for the overgrowth of the endometrium must, of course, remain obscure, although the probability is that it is merely an overgrowth of glandular tissue such as occurs in other parts of the body. The fact that the blood-vessels of the uterine wall are not enlarged shows that congestion and œdema are not the cause of the change.

The Subdivisions of Chronic Metritis.

By Wm. Fletcher Shaw, M.D.

"Chronic metritis" is one of the commonest of gynæcological diagnoses. From a pathological standpoint the nomenclature is hardly correct, but as a clinical term, conveying as it does a definite clinical picture to the gynæcologist, it is invaluable and as such should be retained. By this term we mean a uterus, symmetrically enlarged and hard, which contains no fibromyomata or malignant disease, and which causes hæmorrhage, pain, or leucorrhœa, or a combination of these.

Microscopically a nulliparous can always be distinguished from a parous uterus by the distribution of the elastic tissue. In the former the elastic tissue is confined almost entirely to the internal elastic lamina of the blood-vessels, with a few thin fibrils in the media and adventitia of the vessels and between the muscular fibres of the myometrium, especially in the outer third, while in the parous uterus much more elastic tissue is found, especially *surrounding* vessels and groups of vessels. Goodall [2] describes the reduction in the size of the vessel lumen during the puerperium as due to the formation of a new vessel or vessels within the old lumen. In this way, early in the puerperium, each new vessel, or group of new vessels, is found surrounded by the internal elastic lamina of the old vessel, now very much swollen, and outside this by the media of the old vessel. Normally, as involution progresses, the old vessel wall undergoes degeneration and is absorbed. But anything which retards involution, such as sepsis, multiparity, old age, &c., tends to prevent the degeneration and absorption of these old vessel walls, and so in subinvoluted uteri the new vessels, or groups of new vessels, are found surrounded by masses of elastic tissue, which are really the remains of the internal elastic lamina of the parent vessel and part of the old media infiltrated with much elastic tissue. Theoretically, one would expect that a parous uterus which has undergone a perfectly normal involution would be indistinguishable from a nulliparous uterus, but in practice this is not so, there are always some remains of the elastic layer to be found around some of the groups of vessels, even when involution has been apparently quite normal and the patient has no abnormal clinical symptoms. Such a uterus is the one from which the photomicrograph No. 2 is taken. This patient was aged 27, had one child four years ago, followed by a perfectly normal puerperium, and had regular menstrual periods of average amount since that time. She had an ovarian dermoid removed in January, 1913, and in September, 1913, had to have the other ovary removed as it had in the meantime formed a large ovarian cyst. The uterus, now useless, was also removed at the same time. There is very little elastic tissue to be found in sections of this uterus, but around a few groups of vessels, as in the photomicrograph, a fairly large collection of elastic tissue can be found, and this is quite sufficient to make the diagnosis of parity. I have not examined any parous uterus which could not be readily distinguished from a nulliparous uterus by noting this distribution of the elastic tissue.

Subinvoluted uteri, which histologically show large amounts of elastic tissue around the blood-vessels, form the main mass of those uteri which are diagnosed clinically as chronic metritis. Goodall [3], in a later paper, goes so far as to say that a uterus which does not show this histological sign is not to be diagnosed as chronic metritis, and that chronic metritis cannot occur in virgins. He takes exception to the inclusion of several virgin uteri in my former paper [4] on the ground that they were not stained for elastic tissue and that if they had been no increased amount would have been found. I am now in total agreement with him that these uteri are quite different pathologically from the parous uteri, but I still consider that clinically they must be classified as chronic metritis. Just as well might we say, a rabbit is a rodent, therefore all rodents are rabbits. Chronic metritis is a *clinical* entity and includes at least two, probably more, groups of pathologically different uteri. The object of this paper is to describe two of these groups and it is based on the examination of twenty-nine uteri removed with the diagnosis of chronic metritis and in which no fibromyomata or malignant disease was found.

The statement that these symptoms of chronic metritis occur chiefly in parous women is quite true, but it is not correct to say that they never occur in nulliparæ or virgins. In the series I am now reporting two uteri were from virgins and two from nulliparæ, all of which had the objective and subjective symptoms of chronic metritis and, clinically, were indistinguishable from those occurring in multiparæ.

GROUP I.—CHRONIC SUBINVOLUTION.

These cases come into the general class of chronic metritis with a regularly enlarged hard uterus and with the symptoms of hæmorrhage, pain, or leucorrhœa, though hæmorrhage is by far the most constant symptom.

As examples of this group I have taken twenty-five specimens. It would have been a simple matter to multiply this list, but these are sufficient to prove my points and it seems better not to make tables too bulky in a paper. The specimens were taken promiscuously and are fairly representative of the large class from which they are drawn. Two of the patients were aged only 27 and 29 years respectively, and in both these cases the uterus was removed along with matted appendages; seven patients were in the thirties, and all the remainder in the forties or early fifties. This condition reaches its greatest incidence about the menopause; many of the patients date all their symptoms from a confinement, though many only suffer from weight and dragging due to the heavy uterus until near the menopause when excessive hæmorrhage commences. This is the symptom which generally causes the patient to seek medical advice.

All these uteri present the same appearances. The whole uterine wall is much thickened, usually from $\frac{3}{4}$ to $1\frac{1}{4}$ in. instead of the normal $\frac{1}{2}$ in., and the whole uterus feels harder and denser. The increase in size affects the whole of the uterine wall, and there is no appearance of local overgrowth or tumour. A section through any part of the uterine wall shows the increase in size to be due to an increase in the amount of all the constituent elements of the uterine wall. The proportion of fibrous tissue is often slightly increased, as I have shown in a previous paper [4], but, as this increase only averages 4 per cent. while the total increase in the uterine wall is often 100 per cent., it is quite clear that this increase in thickness of the uterine wall cannot be due to increased amount of fibrous tissue alone, but also to a still greater increase of muscular tissue. Lately it has become fashionable to rechristen this condition "fibrosis uteri"; this has arisen from the mistaken idea that the increase in the size of the uterus is due to fibrous tissue and that the hæmorrhage is due to collections of fibrous tissue around the vessels which diminish the normal muscular control and, though we now know that this is incorrect, many gynæcologists persist in using the term. This causes great confusion of mind, especially among students, and we should be very chary of adopting new nomenclature, based upon pathology, until we are quite sure that those pathological investigations are correct. The majority of the specimens I included in my tables show a slight increase in the percentage of fibrous tissue, especially in the outer third, but in no specimen was it marked around the blood-vessels, nor was there anything like sufficient increase to account for the total increase in the thickness of the uterine walls. The specimen which shows the largest amount of fibrous tissue (No. 12) did not suffer from hæmorrhage. Briggs, in a recent paper [1] read before this Society, confirms the results of my previous paper [4]; in only one specimen did he find sufficient fibrous tissue to account for the total slight increase in size of the specimens.

The most important change in these uteri is to be found in the amount and distribution of the elastic tissue. We noted above that elastic tissue occurs in a nulliparous uterus only as an internal elastic lamina of the blood-vessels and in very small fibrils in the media and adventitia, and between the muscle bundles of the myometrium. In a multiparous uterus in which the puerperium has been normal, the elastic tissue occurs not only as the internal elastic lamina, but also in small collections outside the vessels and groups of vessels, and in increased quantity between the muscle bundles.

In the class of case we are now considering the elastic tissue has the same distribution as in a normal multiparous uterus, but in very much greater amount. The vessels and groups of vessels are surrounded by thick slabs of dense elastic tissue and by muscular tissue thickly interspersed with elastic tissue. This change is very marked in the cases with severe hæmorrhage, not only around the large vessels, but also around the small vessels near the endometrium. Elastic tissue also occurs in large amounts between the muscle bundles and fibres, especially in the outer third of the uterine wall. The blood-vessels are increased in size and their walls thicker than in a nulliparous uterus, but, in the majority of cases, this is not more marked than in a normal multiparous uterus which has involuted well and which has not given rise to menorrhagia or metrorrhagia, nor, in many cases, is the size much more than is found in a virgin uterus. The great change is the large amount of elastic tissue in and around the vessel walls.

Fig. 1 shows the blood-vessels in a virgin uterus. The patient, aged 18, had no uterine symptoms and died in twenty-four hours after an accident. In this section no elastic tissue can be seen except at the internal elastic lamina.

Fig. 2 is from a normal multiparous uterus which is described above. The blood-vessels are of normal size and the walls are not increased in thickness, but a few thick strands of elastic tissue can be seen surrounding some of the vessels. This is sufficient to prove this section to be from a parous uterus.

Figs. 3 and 4 are from the vascular area from a specimen of the chronic subinvolution type of chronic metritis (No. 2 in the table). These sections show the large amount of elastic tissue surrounding the vessels.

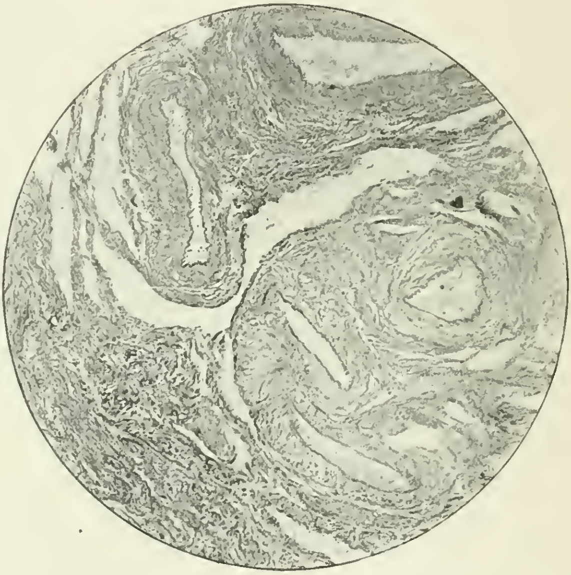


Fig. 1.

Vessels in the uterus of a virgin, aged 18. Note the dark internal elastic lamina of the arteries. There are a few fine fibrils of elastic tissue in the media and adventitia, but too fine to photograph with the low power. Stain : Weigert's elastic and Van Gieson.

Fig. 5 shows a group of small vessels near the endometrium from specimen No. 5. Here the new-formed vessels are seen surrounded by the old internal elastic lamina, outside which is the old vessel wall impregnated with elastic tissue.

The whole uterine wall is much thickened, due to a slight extent to an increase in fibrous tissue, to a larger extent to increase of elastic tissue, and to the largest extent to increase in amount of muscular tissue.

This condition is brought about by involution being retarded and the muscular tissue and elastic tissue not being absorbed.

In fifteen of these twenty-five specimens the endometrium was markedly increased in thickness, but in none of these was it in a state of œdema, as it probably would be if the increased thickness was due to congestion. Nine of the specimens had adhesions around the appendages, showing that there had been considerable inflammatory reaction at some time, most probably during the last puerperium, though none of them gave a history of protracted convalescence. The sepsis in these cases has prevented involution, and so, indirectly, has produced the condition, but we cannot consider the condition to be directly produced by inflammation.

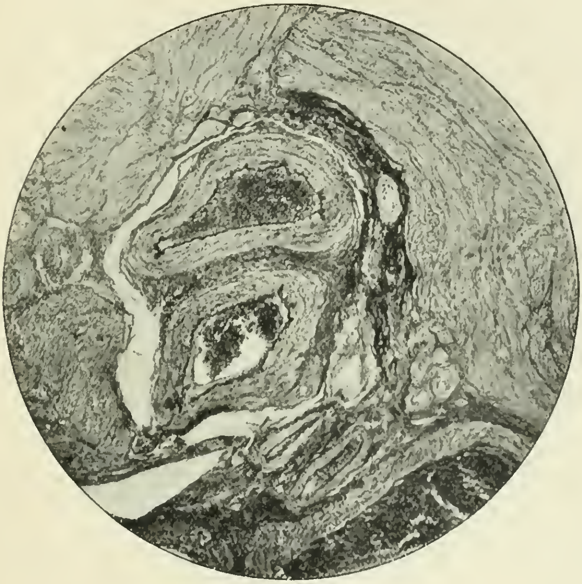


FIG. 2.

Vessels in the uterus of a I-para, aged 27; normal puerperium and no subsequent uterine symptoms. Note the dark internal elastic lamina of the arteries; but to the right-hand side of the vessels, outside their walls, can be seen a collection of thick strands of elastic tissue. This is sufficient to make the diagnosis of parity. Stain: Weigert's elastic and Van Gieson.

Ten of the specimens were from patients whose symptoms dated from their last confinement, while in twelve instances the patients only had symptoms when near the menopause, though their last confinement had occurred several years previously, the shortest time three years, the longest twenty years; one of these patients was aged 34 and another 38, but all the others were well over 40, so we may consider them all as being about the menopause. In three cases I was unable to obtain the duration of symptoms.

The twelve uteri from patients whose symptoms commenced at the menopause show exactly the same changes as the other ten uteri from patients whose symptoms dated definitely from a confinement. In these cases, however, the muscular control over the blood-vessels has been better retained, and it is only at the menopause, when muscular tissue naturally atrophies, that the full effect of this change has come into play. Elastic tissue is not contractile in the same way as muscular tissue, so blood-vessels surrounded by it are not controlled as they are when surrounded by muscular tissue, and a much greater pressure is thus exerted on the small thin-walled blood-vessels of the endometrium. If the strain is greater than these small vessels can stand, menorrhagia is produced, followed, in the worst cases, by metrorrhagia.

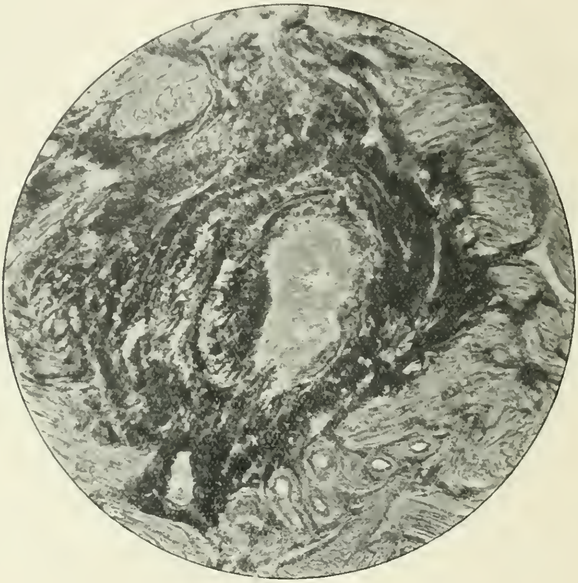


Fig. 3.

A large artery from the vascular layer of case No. 2. Note the large amount of elastic tissue surrounding the new-formed vessel. The smaller arteries below show elastic tissue as internal elastic lamina, and also surrounding them. Stain: Weigert's elastic and Van Gieson.

Of these twenty-five uteri, all but two were removed on account of excessive hæmorrhage, and both these uteri contained a somewhat smaller amount of elastic tissue than the others, though it was still greatly in excess of normal. These patients were aged respectively 27 and 33. If these uteri had not been removed at this early age, on account of pain in one case and with matted appendages in the other, they would almost certainly have suffered from hæmorrhage when they neared the menopause.

One uterus, No. 9, shows no increase in the thickness of its walls nor is the endometrium thickened, nor the amount of fibrous tissue increased. The only marked change between this and a normal uterus is the enormous amount of elastic tissue collected round the blood-vessels, and we must look upon this as the cause of the intractable hæmorrhage from which this patient suffered since the birth of her last child three years previous to operation. In this case involution progressed sufficiently to absorb the superabundant muscular tissue, but,

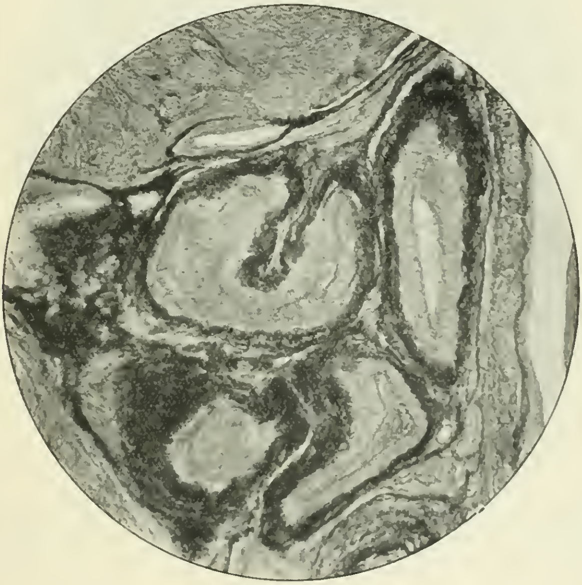


Fig. 4.

Showing several arteries from the vascular layer of case No. 2. Note the large amount of elastic tissue surrounding each artery. Stain: Weigert's elastic and Van Gieson.

owing to some cause not obvious in this case, was not able to absorb the increased amount of elastic tissue. Strictly speaking this is not a case of chronic metritis, as the total thickness of the uterine wall is not increased, but, apart from this, its symptoms, histology and ætiology would cause it to be included.

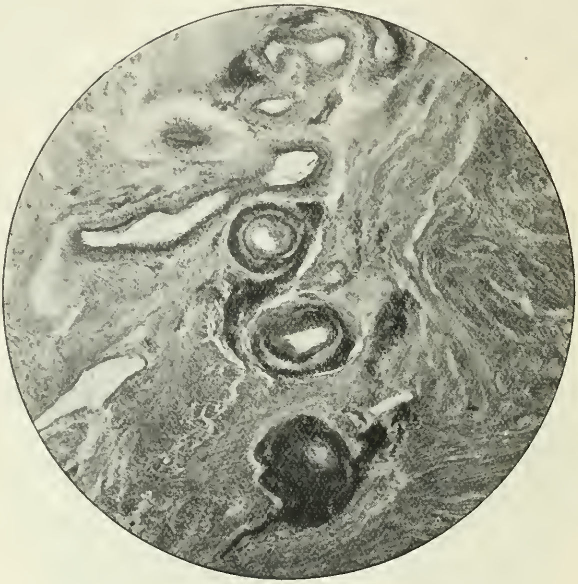


FIG. 5.

Vessels adjacent to the endometrium in case No. 5. Note the black internal elastic lamina of the arteries and the black elastic tissue surrounding them. Stain: Weigert's elastic and Van Gieson.

GROUP II.—HYPERTROPHIC UTERI.

In the group of cases we have just considered all the patients had been pregnant, and the increase in size of these uteri is due to subinvolution. There is, however, another group of cases which present the same clinical features, hæmorrhage, pain, leucorrhœa, with regular enlargement of the uterus, but differ from the last group in that they have never been pregnant. I have obtained four recent specimens of this class, whose clinical features are indistinguishable from the last group, and so must be classified under the clinical diagnosis of chronic metritis, though their histology is so different. These patients varied in age from 30 to 46; two were married nulliparæ and two virgins. All had excessive hæmorrhage and dysmenorrhœa. One had been curetted three times without any permanent benefit. All had uterine walls which were considerably thickened, the one Dr. Donald has described this evening having walls 1¼ in. in thickness, but the most marked feature was the enormous increase in the thickness of the endometrium. Histologically these specimens differed very markedly from all the other group and from a normal parous uterus, in the arrangement of the elastic tissue. In these the elastic tissue followed the same arrangement as in a virgin uterus and was present only as the internal elastic lamina of the vessels and a few very fine fibrils in the media and adventitia and between the muscle bundles of the myometrium. This is the distinguishing feature between a nulliparous and a parous uterus.

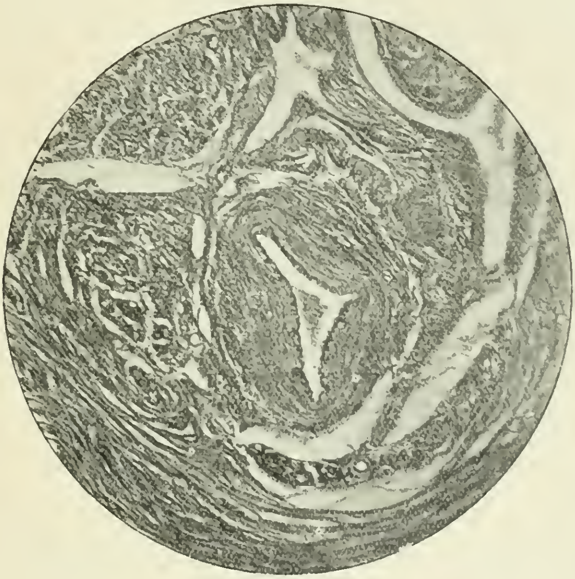


Fig. 6.

An artery from No. 28, Dr. Donald's case. Note the black internal elastic lamina, beyond which, except for a few fine fibrils (too fine for photography with this power) there is no elastic tissue in or around the walls. This is the same arrangement as occurs in a virgin uterus (*see* fig. 1). Stain: Weigert's elastic and Van Gieson.

Fig. 6 shows a large vessel in Dr. Donald's specimen. It will be noted that no elastic tissue can be seen outside the internal elastic lamina.

None of these uteri showed any increase in the percentage of fibrous tissue, the increased bulk being made up of muscular and fibrous tissue in the same proportion as in a virgin uterus. The blood-vessels were not increased in number or size.

In this group the uterine wall may be as thick as in the other group, but instead of the increase being due to want of absorption, it is produced by a definite hypertrophy of all the constituents of the uterine wall. The marked feature of these specimens is the thickness of the endometrium. In Dr. Donald's specimen the endometrium measured 15 mm. in thickness even after being prepared and cut in paraffin, which always causes a large amount of shrinkage. In another specimen the endometrium only measures 1 mm., but I could only obtain one piece of this uterus and the edge of the endometrium had been lost; there was increase in the number and size of the glands, and I have no doubt the endometrium was considerably thickened.

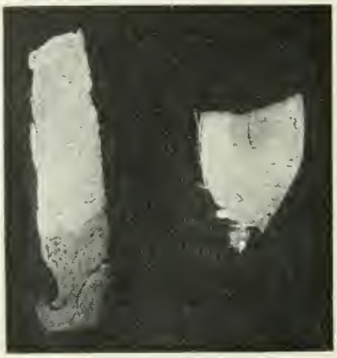


Fig. 7.

A direct print of sections from case No. 28, and the virgin uterus from which fig. 1 was taken. Note the great thickening of endometrium and mesometrium of No. 28 (Dr. Donald's specimen). Stain: Van Gieson.

Fig. 7 is a direct print of sections from Dr. Donald's specimen and from a normal virgin uterus. The great difference in thickness of their walls, and especially their endometria, is well shown.

In two of these specimens the glands were greatly increased in size and number, while in the other two this was not a marked feature. One specimen exhibited a few patches of œdema in the endometrium, but these were not large in proportion to the whole bulk of the endometrium, which was generally of fairly average density.

Fig. 8 shows a portion of the endometrium of Dr. Donald's case. The glands are a little enlarged, but are not more numerous than in a normal uterus. The interglandular stroma is of fairly average density.

It seems to me that, in these cases, the endometrium is primarily at fault: it becomes thickened from some cause unknown and gives rise to hæmorrhage. The reason why hysterectomy is so seldom required for chronic metritis in nulliparæ is due to the fact that the majority of these cases are cured by curetting during the early stages, while the hypertrophy is confined to the endometrium. If this thickened condition of the endometrium is allowed to persist it will act as a foreign body in the uterus, giving rise to increased contractions, especially during menstruation when the endometrium is still more thickened. This usually gives rise to severe dysmenorrhœa and later to a hypertrophy of the whole uterine wall as in any other muscular organ after prolonged increase of work. This cannot be looked upon as a simple overgrowth of the uterus. Why should one organ suddenly take on a regular growth and double its size? If it were a true overgrowth

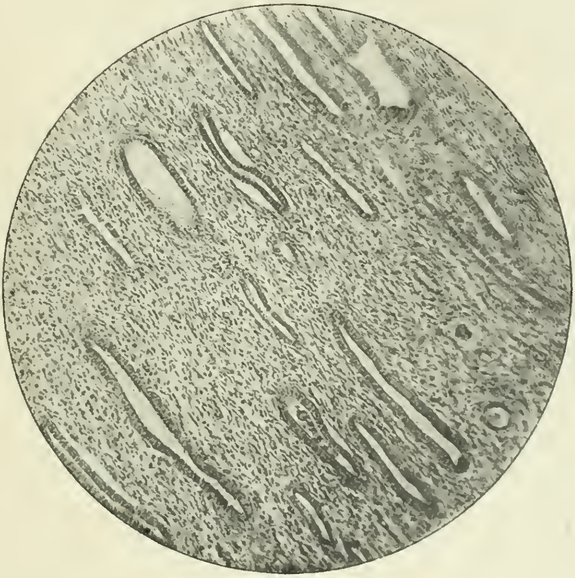


Fig. 8.

Endometrium from No. 28. The glands are a little enlarged; stroma average density. Stain: Van Gieson.

we should expect a greatly increased blood supply, but this we do not find. Congestion, due to displacement or any other cause, would not produce pure overgrowth of all the tissues, but a growth of fibrous tissue out of proportion to the amount of muscular tissue; moreover, there would be œdema of the endometrium, which I only found in one of these specimens, and then only in very small areas. It seems much more reasonable to look upon the case as due to "work hypertrophy." The endometrium is thickened and will act as a foreign body and so stimulate uterine contractions, especially at the menstrual periods when the endometrium is increasingly thickened. This overwork of the uterine muscle will, in the course of time, produce hypertrophy of the whole organ, while at each menstrual period it manifests itself by severe dysmenorrhœa.

CAUSATION OF SYMPTOMS IN BOTH CLASSES.

Pain.—The chronic dragging aching pain which chronic metritis gives rise to is probably produced by the drag of the heavy uterus. This increase in size is due to one of the two causes I have described above: (*a*) late form of subinvolution, or (*b*) work hypertrophy. The former is by far the larger class, and is produced by anything which prevents normal involution of the uterus, the commonest causes being sepsis, old age, and general ill-health of the patient. In this series nine specimens had definite adhesions around the appendages, but sepsis, much too slight to cause matting of the appendages, is still sufficient to retard involution, and so was probably the cause of the subinvolution of many of the other cases. The second class is much the smaller one, but it is just as definite a type. In these specimens the endometrium is much thickened as well as the mesometrium, and sections of the latter show no difference to the virginal condition except this great thickness; that is to say, the uterine wall is greatly increased in thickness, but the arrangement and relative proportion of muscular, fibrous and elastic tissues remain as in a normal virgin uterus. There has been a simple hypertrophy of the whole uterine wall. If these cases are taken in the early stages and curetted the majority are cured, but if left untreated for years, or if the endometrium again hypertrophies after curetting, the myometrium gradually hypertrophies, and curetting will now have no effect, and nothing but hysterectomy will cure the patient. The great majority of these patients have dysmenorrhœa and menorrhagia from puberty, which gradually increases in severity until, finally, hysterectomy has to be performed. This class of case is very common, but fortunately the great majority can be cured in the early stages by simpler methods, and so in comparatively few instances have we to resort to hysterectomy.

Hæmorrhage.—Two factors are operative in the production of hæmorrhage; usually these are found alone, but in some specimens they occur together, and it is then difficult to say which change or changes is responsible for the hæmorrhage.

Thickened Endometrium.—This seems to be the cause of the hæmorrhage in many cases. In the hypertrophic class at any rate the only changes found are simple hypertrophy of the endometrium and myometrium. That the thickened endometrium is the cause of bleeding in many uteri is shown by the good results of curetting, but in these advanced hypertrophic uteri curetting is generally useless, so that, if the thick endometrium is the cause of the bleeding, the condition causing this hypertrophy of the endometrium is still present and causes hypertrophy of the new endometrium. That simple hypertrophy of the uterine wall should cause hæmorrhage is difficult to believe; the vessels are longer, but they curl between the muscle bundles and are not surrounded by an increased amount of fibrous or elastic tissue which would diminish the muscular control of the vessels.

Elastic Tissue.—I have pointed out above that an increased amount of elastic tissue around the blood-vessels is the chief change found in subinvoluted uteri, and that this causes hæmorrhage by diminishing the contractile support of the muscular tissue surrounding the vessels. Several uteri in this class have much thickened endometrium in addition to a large amount of elastic tissue, notably Nos. 16, 18, and 21, whose endometrium measured respectively 8·5 mm., 7·5 mm., and 6 mm.

Thus we have two definite pathological subdivisions of chronic metritis, subinvolution and hypertrophy. That other subdivisions will be proved to exist I do not doubt. It is quite possible that inflammation may cause this condition, though I have not been able to find a specimen which definitely proves this.

It is not sufficient to say that the symptoms followed an inflammatory attack in the puerperium, and that the specimen shows a slightly increased percentage of fibrous tissue. In these specimens the chief increase in size consists of muscular tissue, and inflammation has only produced the condition indirectly by inhibiting involution. Lately Beckwith Whitehouse has published some cases of chronic metritis which give a positive reaction to the Wassermann test, and concludes that in these cases the pathological changes were due to syphilis. It is possible that the syphilis occurred in patients already suffering from subinvolution, and, by causing peri- and end-arteritis, intensified the symptoms. Since reading his paper I have performed hysterectomy for chronic metritis on one patient who gave a very positive reaction to the Wassermann test. Her blood was examined by Dr. Renshaw, Clinical Pathologist to the Christie Hospital, who does a large number of these tests every week, and he tells me she gave a very strong reaction; but, clinically, I should have said there was not the slightest chance of her having been infected. She was a better-class working woman, without the slightest evidence in her history, or on examination, to show that she had been infected, and she had had four full-term healthy children and no miscarriages. This is a subject which requires further investigation.

CONCLUSIONS.

(1) "Chronic metritis" is a clinical term which is used to designate uteri which are regularly enlarged, firm, and cause hæmorrhage, pain, or leucorrhœa.

(2) There are at least two classes of chronic metritis: (*a*) chronic subinvolution; (*b*) hypertrophy.

(3) These two classes can always be distinguished by the arrangement of the elastic tissue.

(4) Nulliparous and parous uteri can always be distinguished by the arrangement of the elastic tissue. (*a*) In a nulliparous uterus the elastic tissue is confined chiefly to the internal elastic lamina of blood-vessels with only very thin fibrils in the media, adventitia, and between the muscle fasciculi of the myometrium; (*b*) in a parous uterus some thick strands of elastic tissue can always be found surrounding some of the blood-vessels.

(5) In the hypertrophic form of chronic metritis the arrangement of the elastic tissue is the same as in a virgin uterus.

(6) In the subinvoluted form of chronic metritis large deposits of elastic tissue are found in the walls and around the blood-vessels.

(7) The hypertrophic form is primarily due to a hypertrophy of the endometrium which stimulates uterine contraction, and in course of time produces a "work hypertrophy."

(8) The chronic subinvoluted form results after parturition when, from any cause, involution does not occur normally.

Class I.—Subinvolution.

No.	Hospital number	Age	Number of children	Years since last child	Duration of symptoms	Chief symptoms			Thickness of meso-metrium	Thickness of endo-metrium	Fibrous tissue	Elastic tissue	Vessels	Appen-dages
						Hæmor-rhage	Pain	Leucor-rhœa						
1	1464/12	40	10	4½	4 years 6 months	+	—	—	14·8 mm.	?	Slight increase	Very much increased	—	Not matted
2	1478/12	37	7	4	4 years	+	+	—	15 mm.	A little thickened	Slight increase	Very much increased	—	Matted
3	1522/12	48	?	?	9 months	+	—	—	16·2 mm.	A little thickened	Not increased	Very much increased	—	Matted
4	1535/12	45	11	3	3 years	+	—	—	19 mm.	3·3 mm.	Slight increase	Very much increased	Enlarged; much elastic tissue in and around walls	Matted
5	1538/12	51	6	9	3 months	+	—	—	16·1 mm.	Not thickened	Not increased	Very much increased	Some enlarged; walls of some almost replaced with elastic tissue	Not matted
6	1121/13	49	1	20	3 months	+	—	—	15·4 mm.	1 mm.	Slight increase	Much increased	A few enlarged; much elastic tissue around submucosal vessels	Not matted
7	1146/13	38	2	12	6 months	+	—	—	1 in.	Polypus	Slight increase	Much increased	A few enlarged; much elastic tissue around them	Not matted
8	1260/13	46	10	10	3 months	+	—	—	¾ in.	Not thickened	No increase	Enormous increase	Some enlarged; many walls apparently replaced by elastic tissue	Not matted
9	1329/13	46	10	3	3 years	+	+	—	½ in.	Very thin	No increase	Enormous increase	Walls almost replaced by elastic tissue	Not matted
10	1356/13	36	7	10	10 years	+	—	—	19 mm.	2 mm.	No increase	Much increase	Some enlarged; some with walls almost replaced with elastic tissue	Not matted

CLASS I.—SUBINVOLUTION—(*continued*).

No.	Hospital number	Age	Number of children	Years since last child	Duration of symptoms	Chief symptoms			Thickness of meso-metrium	Thickness of endo-metrium	Fibrous tissue	Elastic tissue	Vessels	Appen-dages
						Hæmor-rhage	Pain	Leucor-rhœa						
11	1485/13	46	8	5	1 year	+	+	+	19 mm.	3·9 mm.	Increased in outer half	Enormous increase	Some enlarged; walls almost replaced with elastic tissue	Not matted
12	1495/13	33	5	$1\frac{1}{12}$	1 year 1 month	O	+	—	17 mm.	1·3 mm.	Great increase	Much increase	Some enlarged; much elastic tissue in and around walls	Not matted
13	1360/13	27	2	4	4 years	—	+	—	$\frac{3}{4}$ in.	2·5 mm.	Very slight increase	Much increase	Not so much elastic tissue in walls	Matted
14	1147/13	53	5	25	1 year	+	—	—	13 mm.	Polypoid	No increase	Very much increase	Some enlarged; some walls almost replaced with elastic tissue	Not matted
15	1518/13	38	3	3	3 years	+	—	—	15·5 mm.	3·5 mm.	Increased	Great increase	Much elastic tissue in some walls	Not matted
16	1526/13	42	6	3	1 year	+	—	+	19·3 mm.	8·5 mm.	No increase	Very great increase	Some enlarged; much elastic tissue in and around walls	Matted
17	1323/13	32	3	$3\frac{1}{2}$	3 years 6 months	+	+	—	10 mm.	4·4 mm.	No increase	Not great increase	Some enlarged; not large amount of elastic tissue in and around vessels	Matted
18	1248/13	46	4	3	9 weeks	+	—	—	25 mm.	7·5 mm.	Increased	Not great increase	Not large amount of elastic tissue in and around vessels	Not matted
19	1503/13	45	5	7	?	+	—	—	18 mm.	Slight thickening	Increased	Very great increase	Some very large; much elastic tissue in and around vessels	Not matted
20	1019/14	29	3	2	2 years	+	—	+	21 mm.	Thin	Increased in outer third	Very great increase	Some much enlarged; much elastic tissue in walls	Matted
21	1035/14	40	9	4	?	+	—	—	12·5 mm.	6 mm.	Not increased	Great increase	Not much enlarged; much elastic tissue in walls	Not matted

22	1535/13	40	2	19	2 months	+	—	—	22 mm.	3·8 mm.	Increased in outer third	Great increase	Not much enlarged; much elastic tissue round many		Not matted
23	1020/14	42	7	6	?	+	+	—	15 mm.	3 mm.	Increased in outer third	Great increase	Not much enlarged: much elastic tissue round some		Not matted
24	1088/14	34	6	3½	4 months	+	—	—	25 mm.	2 mm.	A little increase in outer half	Very great increase	Not much enlarged; much elastic tissue round vessels near endometrium		Matted
25	1093/14	43	4	9	1 year 4 months	+	—	—	15 mm.	Thickened	Increased in outer half	Very great increase	Not much enlarged; much elastic tissue round vessels		Not matted

CLASS II.—HYPERTROPHY.

No.	Hospital number	Age	Number of children	Years since last child	Duration of symptoms	CHIEF SYMPTOMS			Thickness of mesometrium	Thickness of endometrium	Condition of endometrium	Fibrous tissue	Elastic tissue	Vessels	Appendages
						Hæmorrhage	Pain	Leucorrhœa							
26	1186/12	37	Unmarried		6 months	+	+	+	$\frac{3}{4}$ in.	6 mm.	Glandular endometritis	Not increased	Not increased	Normal	Not matted
27	XXIV	30	Unmarried		6 years	+	+	+	21 mm.	1 mm. (only small part obtained)	Glandular endometritis	Not increased	Not increased	Normal	Not matted
28	1222/13	46	— (Married 5 years)	—	Since puberty	+	+	+	24·5 mm.	15 mm.	Mixed endometritis	Not increased	Not increased	Normal	Not matted
29	1453/13	37	— (Married 11 years)	—	9 years 6 months	+	+	+	14·5 mm.	4·5 mm.	Mixed endometritis	Not increased	Not increased	Normal	Not matted

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[1] Briggs, Henry. "Uncontrollable Uterine Hæmorrhage," *Proc. Roy. Soc. Med.*, 1914, vii (Obstet. and Gyn. Sect.), pp. 195-220.

[2] Goodall, James R. "Studies from the Royal Victoria Hospital, Montreal," ii, No. 3 (Gynæcology II).

[3] *Idem.* "Climacteric Hæmorrhages," *Amer. Journ. of Obstet.*, New York, 1910, lxi, p. 32.

[4] Shaw, W. Fletcher. "The Pathology of Chronic Metritis," *Journ. of Obstet. and Gyn. Brit. Emp.*, 1907, xi, pp. 124-51.

[5] Whitehouse, Beckwith. "Syphilis in Relation to Uterine Disease," *Proc. Roy. Soc. Med.*, 1914, vii (Obstet. and Gyn. Sect.), pp. 123-31.

DISCUSSION.

The President expressed the thanks of members of the Section to Dr. Donald and Dr. Fletcher Shaw for their papers and the admirable microscopic sections which illustrated them. The importance of elastin in various quantities in the uterus in its physiological and pathological relation had not been discussed in this Section before, and it was one of much interest. Weigert's special stain enabled them to identify this elastic tissue and a good deal of work had been done during the past fifteen years, especially by Szasz-Schwarz[1] at Budapest, Woltke[2] at Freiburg, Pick[3] in Berlin, as well as by Goodall[4] and others who had investigated its presence in normal nulligravidæ from infancy to old age and found that a delicate network of fibrils surrounded the muscle fibres and muscle bundles, particularly those of the outer two-thirds of the well of the uterus, diminishing as the endometrium was approached. It was also found in the walls of the blood-vessels, as demonstrated by Dr. Fletcher Shaw in his sections, as a thin layer external to the endothelial lining and in the media. During pregnancy the elastic tissue increased with the growth of the muscle wall and in due proportion, but on the termination of pregnancy the rapid diminution of the muscle left the slower and less highly specialized elastic tissue in greater proportion than formerly—not equally distributed throughout the organ, but in places, some groups of vessels exhibiting it, others not at all, and with each succeeding pregnancy more groups of vessels were so affected. This appeared to be the normal physiological result of uncomplicated pregnancy and labour, and it enabled them to state with practical certainty if a uterus was parous. In old age the wall of parous uteri was found to consist chiefly of elastic tissue with bundles of connective tissue and atrophied muscle fibres. Szasz-Schwarz examined the uterus of a virgin, aged 30—a case of chronic hyperplasia, with uncontrollable hæmorrhage—and found the elastic tissue only increased in proportion to the general hyperplasia; that of the vessels corresponding to that of a healthy nullipara. Pozzi and Lateau[1] recorded two cases where there was great increase of the elastic tissue, but they were both parous women. Woltke and Pick had both found great hyperplasia of the elastic tissue in "chronic metritis" of multiparæ. Dr. Griffith had had sections prepared in the Laboratory at St. Bartholomew's Hospital of uteri removed by him for uncontrollable hæmorrhage, and these gave the same results. He also found that fibroid uteri of nulligravidæ showed no increase of elastic tissue. Under these circumstances it was difficult to attribute any importance to the presence of an excess of elastic tissue in the production of uncontrollable hæmorrhage. The President felt some difficulty in accepting the theory of "work hypertrophy." Was any instance known of a muscle undergoing hypertrophy as a result of work without evidence of increased vascular activity? He hoped that the name "chronic metritis" would not be allowed to take the place of the term "subinvolution" in the large group of cases following labour or abortion, for it was admitted to be incorrect in these cases, and it was doubtful if it was correct for the rarer group of cases in nulligravidæ.

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[1] Szasz-Schwarz, *Rev. de Gyn.*, Par., 1903, vii, p. 593.

[2] Woltke, Ziegler's *Beitr. z. path. Anat.*, Jena, 1900, xxvii, p. 575.

[3] Pick, Volkmann's "Sammlung Klinischer Vorträge," 1900, No. 283 (Gynäkologie, No. 104).

[4] Goodall, *Amer. Journ. of Obstet.*, New York, 1909, lx, p. 921; 1910, lxi, p. 32.

Dr. CUTHBERT LOCKYER admired the persistence with which Dr. Fletcher Shaw had stuck to the tedious subject of "chronic metritis" for many years, and he deserved the gratitude of those whose duty it was to harmonize pathological findings with clinical observation, for the purpose, amongst other things, of systematic teaching in our medical schools. It was generally acknowledged that the subject of "chronic metritis" had peculiar difficulties of its own, especially from a teacher's point of view. In the speaker's opinion we owed more to Dr. Goodall, of Montreal, and Dr. Shaw, of Manchester, than to any other British gynæcologists for the efforts they had made to put the subject on a scientific basis, and to clarify our ideas as to the true pathology of the conditions classed under the above heading. Looking back over the record of work done in investigating the pathology of the metropathic uterus, it was seen that the signs of true inflammation as observed in other viscera were wanting when applied to these bleeding uteri. Round-celled infiltration of the mesometrium was found to be conspicuous by its absence, except in cases of acute puerperal metritis, and in the vicinity of invading malignant growths. In the organ which the late Dr. Cullingworth aptly termed the "clinically malignant uterus," the mesometrium never showed the presence of polymorphonuclear leucocytes. Then came the estimation of the fibrous tissue, both as

[1] Pozzi et Latteux, *Rev. de Gyn.*, 1899, iii, p. 771.

regards distribution and amount, by the use of Van Gieson's stain. This soon showed that the term "fibrosis uteri" was a misnomer and not in accord with pathological facts. Since the relative amount of fibrous tissue and muscle corresponded with general hyperplasia, and any growing increase of the fibrous elements was accompanied *pari passu* with a similar hyperplasia of the muscle elements as well. The four types of distribution of fibrous tissue in "chronic metritis" demonstrated by Meier were interesting, but did not help to bring the pathological and clinical aspects of the problem closer into line. The idea of a "working hypertrophy" as explaining the enlargement of the virginal uterus which Dr. Donald had referred to, seemed to the speaker to be logical, and he remembered first seeing it expressed in Meier's article on the same subject. Since the fibrous tissue investigations had led to no result, the pathologist had turned his attention to the degeneration products to be found in bleeding uteri, and was now estimating the amount and noting the distribution of the elastin produced by the fibroblasts. This—as Goodall, following on German workers, had shown—pointed to a marked distinction between the parous and the nulliparous uterus. Dr. Shaw to-night wished to carry us further by pointing out that the same product, elastin, formed a dividing line between the control virgin uterus and the virginal chronic metritic organ. The speaker pointed out that the two classes of chronic metritic uteri to which Dr. Shaw drew attention by no means embraced the whole class of the "clinically malignant uterus." Leaving out of consideration the bleeding of puberty, there was to be considered the question of how to place at least two other types of bleeding uteri. Dr. Shaw had given us the hypertrophic virginal uterus and the hypertrophic puerperal uterus, which is commonly referred to as "sub-involution," but there was also the non-hypertrophic virginal uterus and the non-hypertrophic menopastic uterus, which behaved in a fashion clinically malignant. The speaker had encountered both these types, the virginal in a patient aged 32, who after three curettings submitted to utriculoplasty, when it was found that the mucosa was only 3 mm. thick, as contrasted with Dr. Donald's case with an endometrium 13 mm. in thickness. Moreover, the same patient, receiving no relief from utriculoplasty, underwent hysterectomy for a bleeding organ which was never above normal size. Similarly with the parous uterus. After curetting a patient, aged 56, expecting to find a malignant endometrium to account for hæmorrhage, the speaker discovered a septic cavity with senile endometritis. As the hæmorrhage persisted, the uterus was removed and found to be smaller than normal. The distinctive pathological feature of the organ was advanced arteriosclerosis—a condition which Dr. Lockyer had long since endeavoured to get Dr. Shaw to recognize, and one which he believed was familiar to Dr. Goodall. The question was, would histology clear up all the problems relative to uteri which bleed abnormally? Until it did, Dr. Cullingworth's nomenclature, "clinically malignant uterus," was the only term sufficiently comprehensive to include the whole class.

Dr. EDEN said that he thought a discussion on uterine hæmorrhage would not be complete without reference being made to the very interesting and suggestive work recently published by Dr. Whitehouse in his Hunterian Lectures. This observer had come to the conclusion that the arrest of bleeding in normal menstruation depended in part upon the production by the endometrium of a body (thrombokinase) which promoted coagulation; and he suggested that excessive bleeding might in some cases be due to a deficiency of this body. With regard to the hæmorrhage of chronic metritis, histology had so far failed to show any definite and uniform structural changes by which the bleeding could be satisfactorily explained. Possibly bio-chemistry would in the future provide the explanation. At any rate, Whitehouse's suggestions deserved consideration, and no doubt his conclusions would be re-examined by other trained observers.

Dr. FLETCHER SHAW, in replying, said references to recent literature on the distribution of elastic tissue in the uterus would be found in Goodall's paper, who gave ample credit to all previous workers on this subject. Dr. Shaw had examined many puerperal uteri to confirm Goodall's results of the process of involution, but as he was in total agreement with these results, and as he presumed all members of the Section were conversant with Goodall's paper, he considered he would be wasting the time of the Section to discuss these results more fully than he had done, or to refer in more detail to the literature. In this paper Dr. Shaw was only concerned with elastic tissue in reference to "chronic metritis." He quite agreed with the President that "chronic metritis" was an unfortunate name, but it did convey a definite *clinical* picture to the gynæcologist, and as such should be retained, at least until we were in agreement as to the pathological changes which occurred in these uteri. He strongly deprecated the use of the new terms, such as *fibrosis uteri*, based upon erroneous pathology. He agreed with Dr. Stevens so far as to believe that chronic metritis might sometimes be due to inflammation, though he had not examined a specimen which definitely proved this. The elastic tissue found in such large amounts in chronic metritis was derived from the internal elastic layer of the old vessels. It was very gratifying to find Dr. Cuthbert Lockyer in agreement with him. He thought it would be better not to include the atrophic nulliparous uterus as a subdivision of chronic metritis, as this uterus would only receive this diagnosis when it had hypertrophied. Specimen 9 would, strictly speaking, come into Dr. Cuthbert Lockyer's group of atrophic chronic metritis. Microscopically it shows the same changes as the other subinvoluted uteri, large masses of elastic tissue around the blood-vessels, but differed from them in the fact that its walls were not thickened. He could not agree with Dr. Eden that the histology of this condition was played out: the fact that such divergent views were still held showed there was need for further work. He had not referred to Beckwith Whitehouse's valuable and interesting paper, as little of it had any bearing upon the particular class of uteri under discussion. Whether his hypothesis, that excess of thrombolysin or diminution of thrombokinase caused hæmorrhage was eventually proved to be correct or not, the alteration in the amount of these substances was very unlikely to produce these large uteri diagnosed as chronic metritis-uteri which gave rise to other symptoms in addition to the hæmorrhage.

Obstetrical and Gynæcological Section.

July 2, 1914.

Dr. W. S. A. GRIFFITH, President of the Section, in the Chair.

Labour obstructed by Carcinoma of the Cervix without previous Symptoms.

By HENRY RUSSELL ANDREWS, M.D.

J. F., AGED 39, was admitted to the London Hospital on March 1, 1914, having been in labour about twenty-four hours. She had had three children within the last four years, and had had no difficulty with any of the labours. On November 1, 1913, she came to the London Hospital complaining of slight bleeding, when she was about five months pregnant. This was diagnosed as being due to a threatened miscarriage. No abnormal physical signs were to be found, and the bleeding ceased after rest. For the next four months, until labour began, there was not a trace of bleeding, and then there was only a very slight show, no more than is usual. The resident accoucheur telephoned to me that the patient was having frequent and strong pains, but the membranes were unruptured; that the cervix was rigid and only about two-fifths dilated. He said that the tissue of the cervix was not friable, and that organ did not bleed on examination. He thought that the rigidity was due to fibrous tissue. I told him to give an injection of morphia, and that I would see the patient as soon as I could. I found that the uterus was contracting strongly, and that the intervals between the pains were short. On abdominal examination the liquor amnii seemed to have escaped; the fœtal heart was heard. The anterior two-thirds of the cervix was hard and firm, feeling as if a portion of a thick rubber ring pessary had been let into the tissue of the cervix. The posterior one-third was normal. There seemed to be an unruptured bag of membranes filling up the os. I could not understand how the membranes could have remained unruptured in spite of such strong contractions of the uterus. There was no ulceration of the cervix, but in one place, in front and to the left, a raised everted edge could be felt. There was practically no bleeding on examination. On exposing the cervix with a speculum it was impossible to diagnose that it was carcinomatous by its appearance, but the point of a uterine sound sank into the tissue about ½ in. with only gentle pressure. I performed Cæsarean section, and then removed the uterus. The endometrium of the posterior part of the cervix was greatly swollen and œdematous. It was this condition that had simulated an unruptured bag of membranes. I intended to remove the uterus by Wertheim's method, but the patient took the anæsthetic so badly that I had to be content with removing the uterus without much cellular tissue or vaginal wall. The anterior wall of the cervix above the growth was so thin that I pushed my finger through in separating it from the bladder. The patient and the infant, who weighed 8 lb., both did very well. I wanted her to come back for radium treatment, but she felt so well that she refused to do this. On examination after removal a hard, white growth, with a smooth, shining surface, was found to occupy all the lower part of the cervix except a little more than an inch posteriorly. Sections showed squamous-celled carcinoma.

I thought that this case was so unusual, carcinoma which was sufficiently advanced to cause obstruction of labour having produced no symptoms, that it was worth recording here.

Dr. AMAND ROUTH commented upon the remarkable permanent cures which had attended Dr. Herbert Spencer's three high vaginal amputation cases treated by galvano-cautery. These cases and two other cases by Dmitri de Ott and Olshausen were delivered by the vagina and operated upon *during the puerperium*,[1] when physiological processes of involution were progressing.

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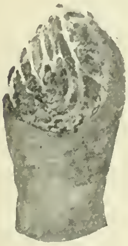
[1] Routh, "Cæsarean Section," 1911, p. 35; Spencer, *Trans. Obst. Soc. Lond.* (1904), 1905, xlvi, p. 371.

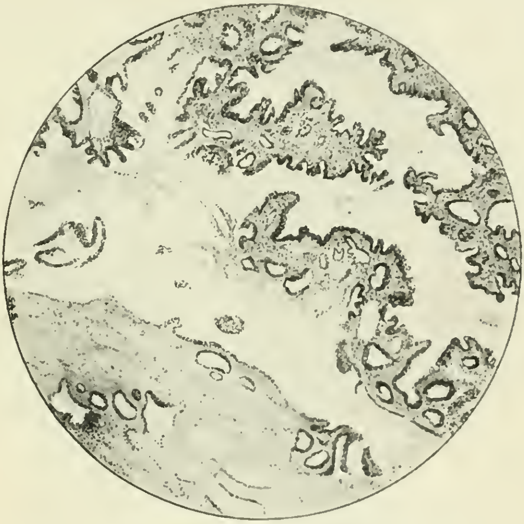
Adeno-carcinoma of the Fundus Uteri.

By H. MACNAUGHTON-JONES, M.D.

DR. MACNAUGHTON-JONES said there were some clinical points and histological features connected with the uterus that made it worth while to bring the specimen forward. The patient from whom the uterus was removed was aged 54, a widow. She had had four children and one miscarriage. For some years she had a discharge from the vagina, which was sometimes coloured, but never offensive. Of late this discharge was constant. There never had been any pain. On examination, the vagina was found to be considerably contracted, the portio low down, and an eroded surface round the os. A year had elapsed since the last period. The uterus was curetted and a portion of the cervix ablated. The following was the report on the curettings: "The tissue was moderate in amount, and very soft. Microscopically, it displays the structure of an adeno-carcinoma. The cancer cells are arranged in the form of irregular tubules and acini, closely packed together in a scanty and delicate stroma. The piece of cervix, which



Growth from fundus.



A section of the growth.

was included, showed no evidence of invasion by the malignant growth of the body of the uterus" (Dr. Eastes' Laboratory).

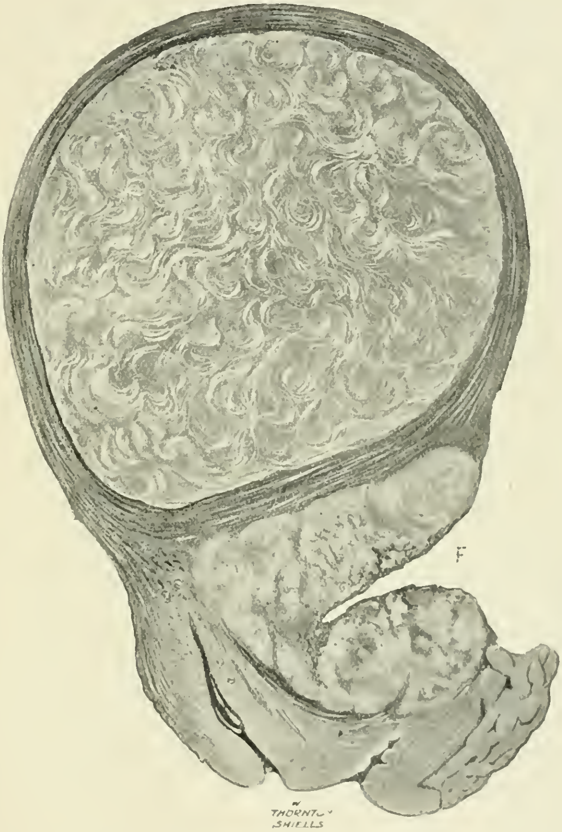
Ten days after the curettage I removed the uterus, which on the exterior appeared to be perfectly healthy, as also the adnexa. The following is the report on the uterus: "Situated in the summit of the fundus of this uterus was a very soft white growth, projecting into the cavity and also penetrating for some distance into the myometrium. Histologically, the growth presents the features of an adeno-carcinoma. It is made up of irregular gland tubules of varying size and shape, closely packed in a scanty and delicate stroma. The growth has penetrated into the muscle layers, but presents a fairly well defined edge. There is a considerable thickness of unaffected myometrium around the growth. A section through the whole length of the cervix shows that there is a good deal of inflammation, with some cystic dilatation of the cervical gland (ovula Nabothi), but the cervix is entirely free of the malignant neoplasm."

Sections of the curettings, and of the growth, which was about 1¾ in. in length by ½ in. in width, were shown, as also a section of the cervix.

Fibromyoma Uteri complicating a Columnar-celled Carcinoma of the Cervix.

By John D. Malcolm, F.R.C.S.Edin.

The patient was a healthy-looking single woman, aged 53. Her periods, which were always free, were irregular for three years, and stopped altogether for several months before September, 1912. There was then a copious hæmorrhage accompanied by a sensation as if something was coming down in the vagina, and in November she sought advice from her medical attendant, Dr. J. H. Philpot, who suspected the presence of malignant disease, but the examination did not justify this as a definite diagnosis, and at least one fibromyoma certainly existed. On January 1, 1913, there was another very free red discharge continuing three days and followed by irregular losses of short duration. The patient was then seen in consultation by an experienced gynæcologist, who diagnosed uterine fibroids and fitted her with a pessary. The discomfort increased, and I was asked to see the patient on March 10, 1913, when the cervix appeared to be short, the os uteri being small and free from any irregularity. There was an obvious fibromyoma of about 4 in. in diameter, and below it, behind and above the os uteri, there was another growth which, when removed, measured nearly 2 in. by fully 2 in. The whole mass was low in the pelvis, and I was told that its bulk had increased since it was first examined, but even its lowest part was slightly movable. The patient did not complain of pain. It was agreed in consultation that the case was one of long-standing fibromyoma, with the broad ligaments extending over the upper tumour and holding it down, and that there was some kind of active degeneration, either malignant or necrotic, in progress. I inclined to the view



F indicates the fracture of the malignant growth made when the fundus was pulled out of the pelvis to expose the parts below it.

that a necrotic change was taking place in a fibromyoma, and immediate hysterectomy was recommended. If Dr. Philpot's view that the patient had malignant disease was correct, there was the more urgent need for operation, because the mass was considered removable.

On opening the abdomen the fundus of the uterus, containing a fibromyoma, was exposed, and very slight traction to pull it out of the way broke it partially off the lower part of the mass, making a fracture behind at the point marked F in the figure, where the new growth was exceedingly friable. As had been thought, the broad ligaments rose high on the sides of the uterus so as to hold down the whole mass, but the lower part was obviously a malignant development so intimately adherent to the ureter, and at the sides to the bladder also, that I would gladly have abandoned the attempt to remove it; but on account of the tear through its malignant part there seemed quite as much danger in closing the abdomen, or in removing part of the tumour only, as in taking the whole away. The operation involved a most difficult dissection to get the ureters and bladder separated without injury to their mucous membranes. Much fat, containing enlarged glands, was removed and the abdomen was closed. I was ably assisted by Dr. Austen Philpot, and Dr. Henry Robinson kept the patient lightly anæsthetized during the whole operation, which lasted about three hours. The shock was so severe that it was more than an hour after the patient was put to bed before I felt justified in leaving her.

A prolonged use of the catheter was necessary; there was a good deal of trouble with the bowels, and the pressure on the external popliteal nerve caused by the Trendelenburg position led to some dropping of the left foot, but convalescence from the operation, though slow, would apparently have been complete if all the growth had been removed. It clearly was not all removed, for it redeveloped so rapidly that symptoms of intestinal obstruction were present five months later, and the patient died within the year.

The removal of a cancer of the cervix uteri should only be undertaken in carefully selected cases, and when the disease is so far advanced as in this case, especially when it is of rapid development, an operation for its removal should, in my opinion, not be attempted. As a rule, the surgeon can estimate the difficulties very accurately after the abdomen is opened, if not before, and it seems to me unwise to continue the enucleation unless there is a good prospect of being able to avoid injury to the urinary tract. That complication was escaped in the case now recorded, and such injuries can of course be treated; but when the danger is great the probability is that the disease will not be completely removed, so that the operation involves a grave risk of immediate death, and still worse of adding the miseries and discomforts of a permanent fistula to those of the advancing cancer. Progress in the treatment of this disease can at present only be looked for in earlier diagnosis and earlier surgical interference, the difficulties of attaining which are well shown by the case now recorded. The presence of the fibromyoma and the mobility, though it was slight, of such a large mass of cancer were very misleading.

The figure indicates the relations of the cervix, the fibromyoma and the new growth, and also shows the fracture of the latter at F. Sections of the tumour exhibited the structure of a columnar-celled carcinoma which was in parts not quite typical, and the opinion of members of the Section was asked for.

Pregnancy with Utero-rectal Adenomyoma, with Extensive Decidual Metaplasia.

By W. S. A. Griffith, M.D.

E. R., AGED 37, married fifteen years; admitted to St. Bartholomew's Hospital in February, 1914. Unipara, December, 1899; no complications. Family history, nothing important known. Health uniformly good. She is very deaf. Mr. C. E. West reports this deafness to be of labyrinthinean type. Her mouth is very septic, with many carious teeth. These were extracted. Menstruation began at the age of 14; scanty and irregular until marriage. Since her confinement normal, lasting four or five days; the last period ceased on September 22, 1913. Expected day of confinement, June 27, 1914. There has been no morning sickness nor has she noticed any enlargement of the breasts.

For the last five years she has had a very slight blood-stained discharge, not needing a diaper, which has increased a little since her last menstrual period, and is offensive. She has had no pain and has not lost flesh. She appears to be in good health and is well nourished. Eight months ago she noticed a small lump in the right iliac fossa. She thinks this has increased in size and is now felt on the left side of the abdomen.

Examination on admission: The breasts present marked signs of activity, with clear secretion. The abdomen is distended by a tumour which extends 9½ in. above the pubes, feeling like a gravid uterus, elastic, but tense without noticeable relaxation. No fœtus felt nor any sound heard on auscultation. On the anterior surface to the left of the middle line is a flat sessile mass not movable on the uterus, and apparently a fibromyoma. The cervix is soft, rather low and near the symphysis; it is fixed by an ill-defined mass between it and the rectum; the vaginal wall of the posterior fornix, though invaded by the growth, is soft and spongy in character, not bleeding after digital examination; but on exposing it with a Sims's speculum and touching it with dressing forceps, very free arterial hæmorrhage followed. The mucous membrane of the rectum is not included in the growth. A fragment of the growth was removed through the posterior fornix for examination. The abdominal tumour was the gravid uterus, much distended by an excess of liquor amnii, with a fibroid in its anterior wall. Abderhalden's

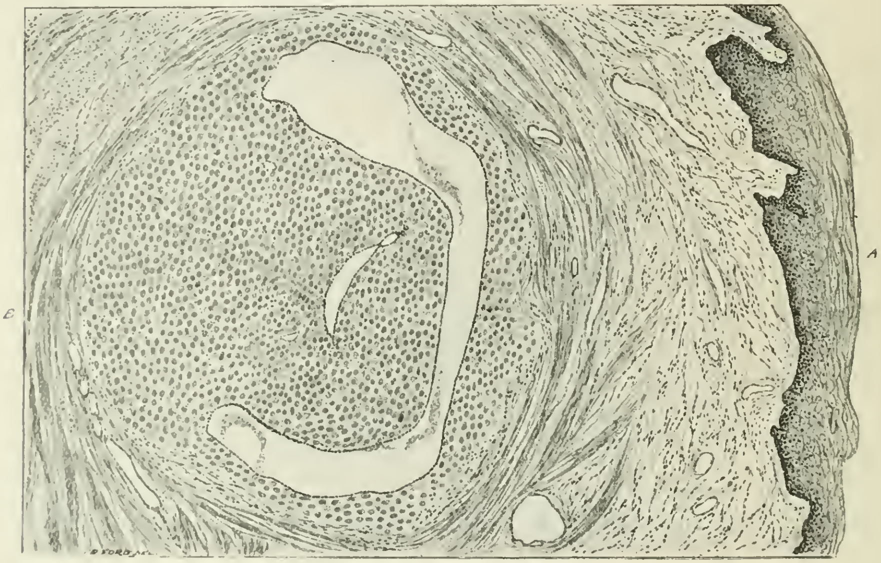


FIG. 1.

Adenomyoma of pregnant uterus invading the utero-rectal septum. Section showing the structure of the growth taken through the posterior vaginal fornix. *A*, vaginal wall; *B*, mass of decidua surrounding a cavity lined by a single layer of flattened epithelial cells, presumably a gland cavity.

tests for pregnancy and carcinoma were made by Mr. Mackenzie Wallis, who reported as follows: Serum plus carcinoma tissue—reaction faintly positive by dialysis; serum plus placenta tissue—very faintly positive. The optical test was not done owing to insufficient material.

It was decided to watch the patient with the prospect of delivering by Cæsarean section.

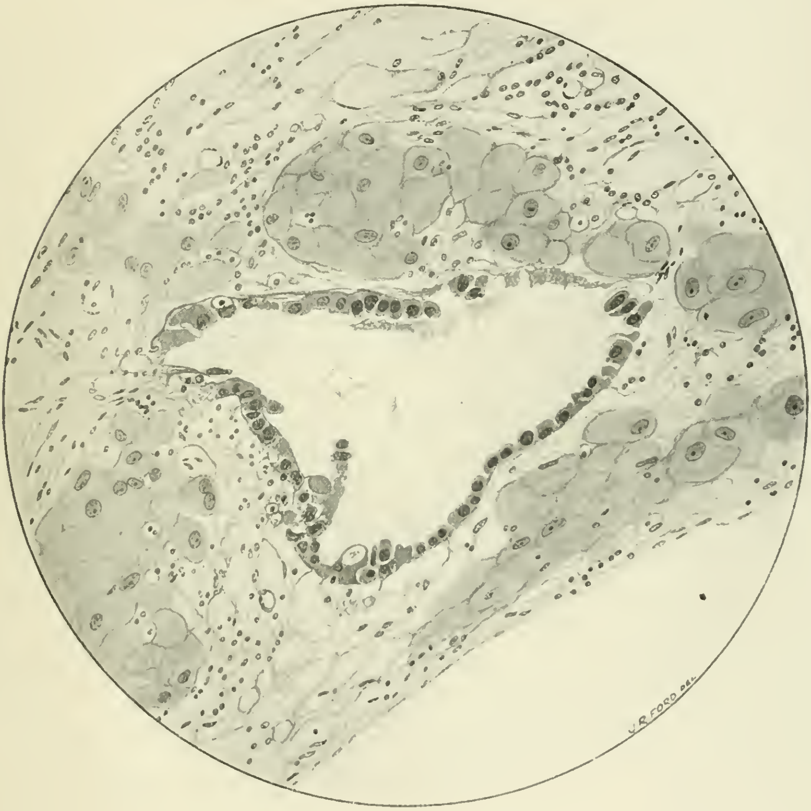


Fig. 2.

Adenomyoma of pregnant uterus, invading the utero-rectal septum. Section of gland retaining its epithelial lining, surrounded by three or four layers of decidual cells.

March 20: The uterus now reached nearly to the costal margin and equalled in size one of the eighth month; much liquor amnii; fœtal head at brim. The cervico-rectal growth had increased considerably, compressing the rectum and extending on the right side as far as the sacro-iliac synchondrosis. It was therefore decided to try the effects of radium, which was very kindly lent by Dr. Finzi.

March 27: 100 mg. of radium bromide protected by 2 mm. of platinum was inserted into the middle of the growth through the posterior fornix, and beside them two other tubes, one containing 37 mg. of radium carbonate, the other 50 mg. of radium bromide, and were removed after twenty hours' exposure. A few days afterwards she was sent home.

She returned to hospital on June 20; she is in good health, the excess of liquor amnii is much less, the fœtus lies obliquely with the head to the left, occiput anterior at the brim, and the body obliquely to the right; the fœtal heart is heard above the right Poupart's ligament. There has been no vaginal discharge since the radium was applied, and the cervico-rectal mass is much diminished and soft, so that there is a good prospect of spontaneous delivery.

Sections stained by Van Gieson's method show large masses of typical decidual cells in a stroma of muscle and connective tissue. Within each mass is a cleft, simple or branching, lined by a thin lamina composed of flattened epithelial cells. In one part is seen a dilated gland tubule lined by low cubical epithelium and completely surrounded by large decidual cells in three or four layers only. We may conclude that the clefts seen in the large masses of decidual cells are similar tubules, the epithelium of which has been compressed into the thin lamina by the pressure of the surrounding mass of decidual cells. We may also conclude that the histological features are those of an adenomyoma, and that the stroma cells surrounding the gland tubules have undergone decidual reaction. This decidual change supports the view that extra- as well as intra-uterine adenomyomata are of Müllerian origin. The marked diminution of the hydramnion may be only a coincidence; it certainly followed the application of radium.

Migratory Adenomyomata of the Uterus.

By Archibald Leitch, M.D.

Adenomyomata of the uterus are not uncommon, though they have only been recognized in this country for the last ten years. It is sometimes possible to diagnose the condition clinically, but generally they are indistinguishable from ordinary fibroids or cases of fibrosis uteri, even on macroscopic examination, and the true nature is only detected on histological examination. In the commonest, or diffuse, condition there is a general thickening of the uterine wall with no sharp demarcation of the endometrial layer. Microscopically we find gland tubules, for the most part embedded in a loose cellular matrix, surrounded by the fibromuscular tissue which has undergone hyperplasia, and in most cases it is easy to demonstrate the connexion between these islets and the endometrium. Generally the invasion of endometrium takes place over a wide area, but sometimes the position of entry is more restricted and the connexion between the two is difficult to establish. Of course a single deep prolongation of endometrium into the muscle, which is not uncommon, is not sufficient to justify the name of adenomyoma, but such penetrations, both in the body and in the cervix, show us how these growths start and also demonstrate the liability of endometrial tubules to proliferate along chinks in the musculature. The outstanding feature of the adenomyoma is the infiltrative nature of the essential constituents, not a destructive infiltration or lymphatic permeation such as we get in carcinoma, but a "worming" of endometrial tubules amongst the loose tissue between muscle bundles. The fibromyomatous constituents are probably due to the irritation produced by the infiltrating gland tubules, and this connective tissue reaction may be out of all proportion to the amount of glandular epithelium. The frequent formation of small cysts is probably due to the contraction of the connective tissue, and such contraction, as perhaps also the endeavours of the uterine muscle to expel the growth, would account for the separation of the tumour from its endometrial connexion. We sometimes find intramural adenomyomata in which it is impossible to demonstrate any endometrial connexion. They may be extruded into the uterine cavity, or they may become serous-covered pedunculated tumours when they reach a free surface. These we may call "*migratory adenomyomata.*" Finally they may make their way into the broad ligaments or even into the rectovaginal septum. All these tumours have a histological similarity, and the recognition of the migratory characteristic will serve to account for the presence of adenomyomata outside and apparently unconnected with the uterus. I recently examined a specimen of an adenomyoma situated at the base of the right broad ligament which was still connected to the posterior wall of the uterus low down by a thin pedicle. This connexion might quite well have been missed, or it might have been broken off naturally in the course of time, as I believe often happens with these extramural adenomyomata, and the association with the uterus would have been lost. It is this want of demonstrable connexion with the uterus that has kept alive the theory of origin from aberrant remains of the Müllerian or Wolffian ducts. It would be idle to deny the occurrence of such embryonic rests, but that they have a greater liability to give rise to tumour formations than normally situated tissues, as Cohnheim held, is a hypothesis which is now discounted. The cells composing them manifestly age just the same as normal cells and the embryonic potentialities for growth depart with their youth.

Adenomyoma—or adenomyositis, as some prefer to call it—of the rectovaginal septum has attracted some attention during the last six years. Cases of this very interesting condition have been reported by several gynæcologists. One observer, Sitzenfrey, in 1909, reported no less than four cases in his own experience occurring within quite a short space of time. When Dr. Cuthbert Lockyer[1] called attention to such a case before this Society last year several other members recalled similar cases. Cullen has recently cited two cases where the condition was not so far advanced. Apart from the adenomyoma at the base of the broad ligament which I have mentioned, I have had two cases of septal adenomyoma within a year. They are therefore not uncommon, and their clinical recognition is of much importance. All the authors hitherto have attributed their origin to Müllerian or Wolffian duct remnants, or to serous inclusions. The latter seems to be the favourite theory. Here the supposition is that the endothelial cells metamorphose into columnar epithelial cells, and not only so but they imitate the tubules of the endometrium in a most perfect way, In the two cases that I have seen the septal tumours became excessively painful during menstruation. It stands to reason that if we can imagine a metaplasia of endothelium into glandular epithelium we can persuade ourselves that the cellular stroma in which the tubules are sometimes embedded, is, though histologically identical with the endometrial stroma, really a chronic inflammatory process. It is clear that the possible endometrial origin has not been rejected without a thought, for in those cases that were fairly carefully investigated the tubules were traceable into the rectal wall and also into the uterus, but they were not found to join the endometrium, at least in the sections examined. It was certain they did not arise from the rectal epithelium: hence the suggested origin from "rests" or from the peritoneum of Douglas's pouch. In one of my cases the lower part of the uterus was very hard and thickened and there was a continuation of this hardness along the tissue of the left sacro-uterine ligament, but it stopped short of the rectal wall. The uterus and the backward prolongation were removed under the belief that the condition was a carcinoma of the endocervix infiltrating the sacro-uterine ligament. I do not think carcinoma of the uterus spreads in that direction, and before the specimen was cut I suggested adenomyoma. So it proved. The cervical endometrium had invaded the musculature of the cervix very deeply: right throughout it there

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[1] *Proceedings*, 1913, vi, p. 112.

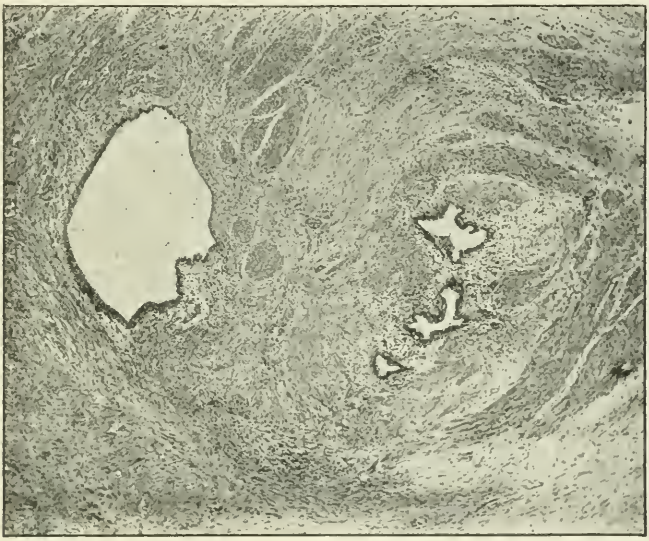

Fig. 1.

A septal adenomyoma; section through left sacro-uterine ligament.

were small tense cysts. Unfortunately a continuous section was not taken right into the sacro-uterine prolongation and so I cannot be quite certain of the continuity of the process, but a transverse section across the latter portion showed the typical appearance of adenomyoma (fig. 1) with tubules imbedded in cellular stroma. The other case showed actual invasion of the rectum. Here there were sections of gland tubules found in the submucosal layer of the rectum, in the mixed structure composed of rectal muscle and abundant fibrous tissue of the tumour proper, in the vagina beneath the epithelium, in the substance of the cervix, and scattered here and there right up to a much hypertrophied and cystic endometrium at the level of the internal os. To the naked eye it was evident that the cysts extended through three-quarters of the thickness of the wall. It is rather surprising to find that the tubules are exceedingly sparse, the bulk of the tumour in the septum being composed of dense fibrous tissue. In the attempt to trace the origin of the tubules it was found that they had wandered by a very devious route from the endometrium to the rectovaginal septum, and a single large section would probably have failed to show the connexion between them.

But the most interesting case, on which I rely to show both the infiltrating and migratory properties of adenomyoma of the uterus, occurred two years ago. The particulars of the case are as follows: The patient was a lady, aged 33, under the care of my colleague, Mr. Cecil Rowntree. She complained of epigastric pain brought on by any slight exertion. She had long been of a very constipated habit, and had been employing rectal irrigation for four months. The menstrual history was unimportant. She complained of pain in the back and had been losing flesh. Enemata were returned in two or three distinct portions. X-ray examination showed marked visceroptosis. Her symptoms were held to point to ptosis of the sigmoid colon, and in July, 1912, laparotomy was performed under this diagnosis. Mr. Rowntree found a very long sigmoid loop lying in Douglas's pouch, the left ovary enlarged and prolapsed, and adhesions between the left broad ligament and the meso-sigmoid. The broad ligament was divided and the ovary removed. The sigmoid loop was pulled up out of the pouch of Douglas without difficulty. On replacing it there was noticed on its antimesenteric border a small puckered area, ½ in. in diameter, at the midpoint (the most dependent part) of the loop. Underneath this area there was a very hard nodule in the bowel wall of the size of a Barcelona nut. It seemed from its appearance and the sensation it gave to the finger to be perfectly typical of carcinoma, and such was the opinion of Mr. W. Ernest Miles, who happened to be in the nursing home at the time. Inspection of the posterior wall of the uterus showed a localized thickening or plaque of growth under the peritoneum at the junction of the cervix and corpus. On allowing the sigmoid to take up its previous position it was found that the two came into contact. The plaque—flat, circular, hardly raised from the surface, a few millimetres in thickness—was considered to be an implantation of cancer from the sigmoid. Under such circumstances a radical operation had to be postponed until the patient's relatives were informed. The uterine plaque was removed, and when I examined it I found it to be an adenomyoma. Permission was given for a local resection of the sigmoid growth, but at the operation before proceeding with the resection Mr. Rowntree opened into the bowel beyond the margins of the growth and found that the epithelial layer was quite intact. A small portion of bowel was therefore removed and end-to-end anastomosis performed. The specimen showed a small

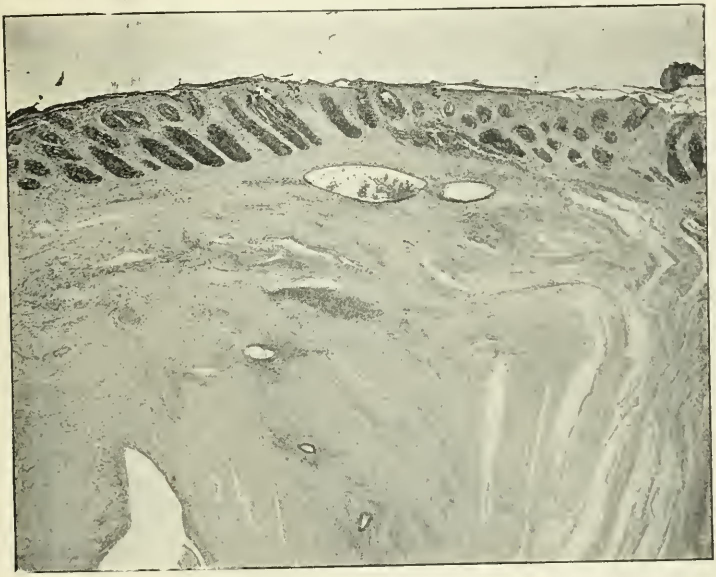

FIG. 2.

Adenomyoma invading sigmoid pelvic colon. Gland tubes in submucosa and also in circular muscle coat.

puckered area on the serous surface with slight hæmorrhage: cutting through this we found a white fibrous growth with rather indefinite margins apparently extending right up to the mucous layer but not involving it. On microscopic examination it is evident (fig. 2) that the outermost part is composed of fibrous tissue in which are found gland tubules surrounded for the most part by a small amount of cellular stroma. These tubules spread out into the muscular coat, which is much distorted: they reach right up to the submucous coat, and some sections show them actually in the mucous layer, from the tubules of which they can be distinguished by the absence of goblet cells and mucinous material. The raggedness of the little puckered area on the serous coat and the presence of hæmorrhagic areas in that situation show that it has lately been adherent to something else and that the adhesion has been broken. The sequence of events almost certainly is as follows: An adenomyoma having started from the endometrium migrated, or was extruded, through the wall posteriorly; owing to hæmorrhage occurring during a menstrual period the serous surface was broken; the loaded and dependent sigmoid colon became adherent to this; the glandular constituents infiltrated the wall of the sigmoid; the adhesion became attenuated by movements of the intestine, and at operation the slender adhesion was broken, leaving a discoid portion on the uterus and an abraded area on the colon. Supposing a greater length of time had elapsed the scar on the sigmoid might have healed over and the evidence of connexion between the two would have been quite lost. As it is, it serves to show how the tumours infiltrate and migrate, and we need not invoke the theory of rest-cell origin to explain the occurrence of such tumours in situations at a distance from the endometrium.

DISCUSSION.

Dr. CUTHBERT LOCKYER, in opening the discussion on Dr. Leitch's paper and Dr. Griffith's specimen, congratulated the authors on their valuable contributions to the subject of extra-uterine adenomyomata. Dr. Lockyer thought it would add interest to the debate if he posed as an opponent to some of the views expressed as to the histogenesis of these so-called adenomyomata. He recalled the fact that a year and a half ago he had shown a case of what he had then termed adenomyoma of the rectovaginal septum,[1] and he had suggested that the condition arose from rests of the Wolffian body; since that time he had investigated the literature upon the subject more fully, and was prepared to admit to a complete change of front as regards his views on the origin of the condition under consideration.

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[1] *Proceedings*, 1913, vii, p. 112.

First, as regards Dr. Griffith's case, the exhibitor held the view that the diffuse mass which he had found in the rectovaginal septum was of Müllerian origin, and as Dr. Griffith had used the adjective "uterine," Dr. Lockyer supposed him to mean that he implied a post-fœtal Müllerian origin for the "growth"—i.e., that it arose from the mature uterine mucous membrane. The speaker, for purposes of debate, stated that he would advance arguments to show that the "tumour" was not of uterine origin, and secondly that it was not a "tumour" at all, in the common acceptation of the term. What reasons could be given in defence of an origin from the mucous membrane of the uterus? Was there anything in the epithelium lining the tubules to suggest it? Certainly not. Von Recklinghausen would have as much right to say it was fœtal as the exhibitor to say it was post-fœtal, or to say it was dystopic rather than orthotopic; in fact, the epithelium did not help to solve the question either way. Was it, then, the cytogenous mantle clothing the epithelial tubules which proved the origin from the uterine mucosa? This cytogenous tissue was certainly behaving in the same way as the stroma of the uterine mucous membrane does in response to pregnancy; that is to say, it was demonstrating a physiological activity in the shape of decidual change; a most interesting phenomenon enough, but did it prove a uterine origin for this tissue? Assuredly not. First, because decidual change in connective tissue cells is not confined to the uterine stroma. Dr. Lockyer had demonstrated it on the surfaces of both ovaries, on adhesions at the back of the uterus and over the peritoneum; moreover, Meyer had proved the presence of decidual change in the hyperplastic tissue around inclusions of peritoneum which had found their way into scar tissue. Therefore the decidual change in Dr. Griffith's "growth" did not prove that the latter was of uterine origin. Lastly, did the presence of the characteristic cytogenous or lymphadenoid mantle itself prove that the "growth" arose from the mucosa? This tissue undoubtedly bears a very close resemblance to the *stroma* of the uterine mucous membrane, but mere resemblance is no proof of identity. There were many reasons to show that there was no histogenetic relationship between the rich cellular investment of the tubules in the "growth" and the stroma of the endometrium. The first objection was a topographical one. If this tissue was migrated stroma, then it must have come from the *body* of the uterus, as the cervical endometrium is entirely devoid of such tissue. Now, the transmigration of endometrial stroma from the body of the uterus to a retroperitoneal "growth" between the vagina and the rectum is a far cry: in fact, Dr. Lockyer could not think it at all probable that such a metastatic leap of benign compact tissue would occur. Again, was this displaced tissue uterine at all? The speaker advanced the work of Professor Meyer to show that it was not. Meyer stated definitely that it was nothing more than the fixed tissues of the part altered by the hyperplasia consequent on inflammation. He said heterotopy or heteroptosis of endometrial stroma was out of the question altogether. Professor Meyer's proofs were these. The cellular mantle surrounding the heterotopic epithelial tubules contains plasma cells in sufficient numbers to prove a pre-existing inflammation; secondly, it contains *in its centre*, as well as at its periphery, fragments of elastic fibres, and since these fibres are absent in the normal mucosa of the uterus (except in old women) it is obvious that the mucosa of a pregnant woman could not have transported a tissue containing elastin. Having disposed of the essential features of the "growth"—i.e., the epithelial spaces and their cytogenous mantle—there was nothing else left on which to form an argument to defend the hypothesis that the "growth" is of uterine origin.

Coming to the other statement which he had made—viz., that the interesting pathological condition was not a "growth" at all—Dr. Lockyer suggested that it was a case of parametritis (or pelvo-peritonitis) posterior containing epithelial inclusions, the source of which was unknown but probably serosal. That is to say, the inclusions probably arose from the endothelium of the peritoneum forming the pouch of Douglas. It was now commonly accepted, thanks to the work of Meyer more especially, that "adenomyomata," wherever they arose—whether in the genital tract or in the bowel or elsewhere—are the successors of an inflammatory process. They begin as epithelial heterotopy, which, as Ziegler said, was a characteristic phenomenon in the process of repair.

"Adenomyoma" was therefore an instance of regeneration run riot. The process was well illustrated by studying the histology of salpingitis isthmica nodosa: given a spot of ulceration or granulation tissue, or even round-celled infiltration, the epithelium in the neighbourhood trespassed across the physiological border—i.e., burst through its basement membrane, and tracked along the round-celled infiltration or penetrated the granulation tissue. Once within the muscle wall the site of entrance became obliterated by scar tissue and the mucosal epithelium on the side of the lumen became regenerated. The snared follicle of epithelium then began to branch in all directions, and a gland complex was produced which von Recklinghausen imagined to be a true organoid tumour containing collecting and secreting tubules, end-bulbs, pseudo-glomeruli, in fact everything but Glisson's capsule and the representative of the paroöphoron. This picturesque bubble has burst, but the fact remains that from an inflammatory process a pseudo-neoplasm is produced which comprises "gland" spaces lined by cubical epithelium and surrounded by a rich cellular hyperplastic tissue; all this in a muscular stroma which itself is actively hyperplastic. This, in the case of the tube, leads to a "tumour" which invades the ligamentum latum and may assume considerable proportions. In the intestine the same thing happens, and also in the wall of the stomach deep to an ulcer. Dr. Lockyer had proved this in a case of Mr. Malcolm's. Professor Meyer had shown the same occurring in connexion with a stricture of the sigmoid mesocolon. The situation of Dr. Griffith's tumour suggested that the inflammatory process had been a parametritis, or pelvo-peritonitis, which by heterotopy of the epithelium of the overlying peritoneum had resulted in "gland" spaces forming in the organizing exudate, and the formation of a so-called "adenomyoma." The same explanation applied in a modified degree to Dr. Leitch's adenomyoma of the broad ligament with its strand still adherent to the cervix. This may be regarded as a nodular parametritis containing epithelium derived from the mucous membrane of a split or inflamed cervix.

The derivation of the heterotopic epithelium must vary with the situation of the pre-existing epithelium. With chronic metritis the mucosa of the endometrium after it has penetrated into the chinks of the inflamed muscle will produce the well-known adenomyoma uteri or adenomyositis. With the posterior extra-uterine "growths" the fair assumption is that the epithelial inclusions are derived from the serosa and so on. The power of pre-natal or fœtal epithelium to do the same thing—i.e., become infiltrative and produce pseudo-neoplasms by invasion and overgrowth—must be admitted, and there are as yet no means by histology of distinguishing between dystopic or fœtal growths on the one hand, and orthotopic or post-fœtal "growths" on the other. As soon as observers attempt to dogmatize we at once are led to exclaim: "Quot homines, tot sententiæ." Success with radium in inflammatory processes was hardly to be expected.

Dr. HERBERT SPENCER said that the interesting paper and demonstration by Dr. Leitch on ordinary adenomyoma uteri did not add much to our knowledge of the subject, for which we were mainly indebted to Dr. Cullen's great work. He did not think Dr. Leitch had given any proof of his theory that sigmoid adenomyoma and retro-uterine "adenomyositis" were due to migration of endometrial glands. The President's extremely interesting case of adenomyositis uteri of the recti during pregnancy showed typical decidual cells around the glands; but he could not agree that these proved the Müllerian origin. He supposed every obstetrical schoolboy of the present day knew that the peritoneum formed decidual cells during pregnancy. He looked forward to the later history of the President's case treated by radium. It would be a great advance if radium did away with the necessity for operation, which was sometimes called for by the severe dysmenorrhœa to which the disease gave rise. He wished to point out, however, that one of the cases shown to-night, treated by radium, showed no diminution of the fibrous tissue, even if there was no increase, which is one of the most disastrous results of radium, producing sometimes complete intestinal obstruction. Wolff had found that X-rays had not much effect on the growth. Dr. Spencer was interested to observe Dr. Lockyer's change of view; he even ventured to hope it was due to remarks made and references given by the speaker in criticizing Dr. Lockyer's case shown before the Section a year and a half ago, in which Dr. Lockyer had excised the rectum, producing a permanent fæcal fistula in the loin. Dr. Spencer had not accepted Dr. Lockyer's advice to operate on his second case, which was practically free from symptoms. He had examined the patient recently and she was quite well, although the adenomyositic growth was as before. Dr. Spencer had had a third case in which extremely severe dysmenorrhœa had caused him to operate. In that case, after separating the bladder and ureters, he had removed the uterus and the growth from the wall of the rectum with the galvano-cautery, and the patient recovered with normal defæcation. Dr. Spencer had at the same meeting called attention to the researches of Dr. Meyer, Amann and Renisch on the serosal origin of these retro-uterine tumours. This view was supported by a great deal of exact observation by Dr. Meyer, Prib, Orloff, Ivanoff, Opitz and others, and appeared to be the source in his own third case. The Müllerian and Wolffian theories would not explain some of the remote adenomyomata which had been found in the sigmoid, small intestine, stomach, pleura, pericardium, as well as in the pedicle of a ventrofixed uterus. He agreed with Dr. Lockyer that adenomyositis was not a "tumour" except in the clinical sense. He thought also that the ordinary diffuse uterine "adenomyoma" was not a "tumour," but a hypertrophy and hyperplasia of the glands and stroma.

Dr. Archibald Leitch said that the origin of these tumours from serosal endothelium seemed to him very far-fetched. He could not find in them any histological evidence whatever pointing to an inflammatory causation. The serosal origin would never have been thought of if it had not been for the difficulty of establishing a connexion with the endometrium, and to assume two such utterly diverse origins of tumours in every way histologically identical would require very strong evidence. As he could trace all stages between adenomyomata obviously arising from the endometrium and adenomyomata separated from the uterus he thought the theory of migration more plausible. From the clinical point of view this theory gained support by the fact that these aberrant tumours became very painful during menstruation. It was a small matter whether they considered the condition a tumour or a hyperplasia, because there was no sharp distinction between the two.

The President concluded the Meeting and the Session by a brief address in which he gave a résumé of the work of the Session and reported on the work of the Council of the Society, as a member of which he had represented the Section.

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